

OCTOBER 1951

35 CENTS

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

REG'D. TRADE MARK, GREAT BRITAIN, NO. 460426

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See page 81

In Full Color--

**AIR FORCE CAMERAS
SPY OUT THE ENEMY**

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"They Fool You Every Night"**

Rowell Brown

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anti-freeze . . .**



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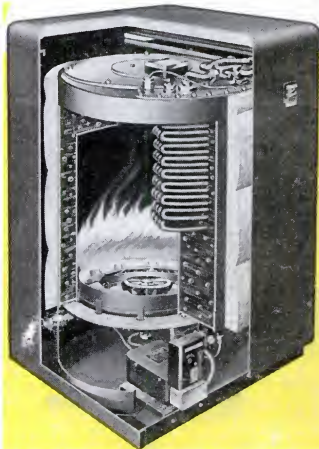
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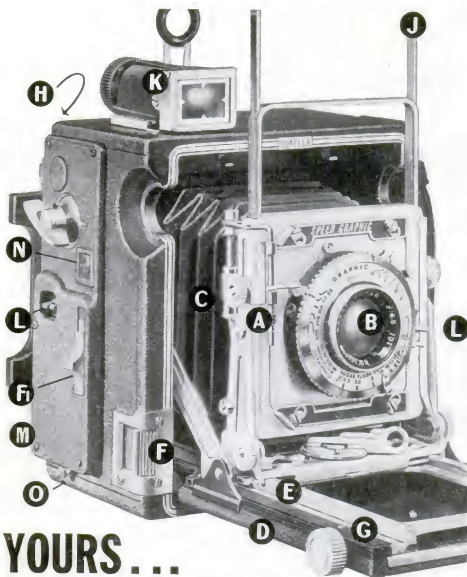
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This One



CW14-PTA-2HCK



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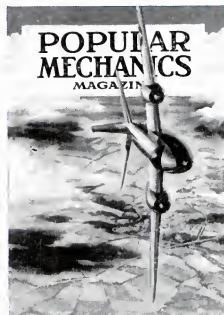
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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

FOR THE FIRST TIME in 34 years a British-designed aircraft has been ordered into production for our own Air Force. It's the Canberra, roaring on a wing tip out of our cover. Only a top-notch foreign plane would be adopted by our Air Force, and the Canberra fills the bill. A few months ago it established a new transoceanic speed record despite stiff headwinds. The average speed was about 444 miles per hour, but the plane is reported capable of topping 600 miles per hour. It also is the first jet to fly the Atlantic nonstop without refueling in flight. Powered by two jet-turbine engines, the Canberra is something new in bombers—it's about as maneuverable and fast as the best fighters. From ground level to 60,000 feet it's an efficient fighting machine. In the story beginning on page 81 you'll find out how the versatile Canberra, built by Martin, may be fitted into our own system for close air support of ground troops

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STOP- don't put your poor, protesting feet on that cold floor!
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THE EDITORS



FOR 34 YEARS Col. George W. Goddard, author of "Our Eyes Aloft Spy Out the Enemy" (page 97), has been getting a lens-eye view of the globe. His graduation from the first officers' school in aerial photography in 1917 touched off a string of inventions and developments that helped make possible the feats of today's flying shutters. Two major Goddard accomplishments are the invention of shutter and flash equipment for the world's first aerial night photograph and the development of low-altitude, high-speed photography. He also pioneered in the quick processing of film and prints in flight, the use of moving film magazines for night and day photographic missions and stereoscopic aerials. Colonel Goddard is now chief of the Air Force's photographic laboratory.

There May Be Flies On Some of Your Jets

Flies, believe it or not, have been upsetting the test flights of jet planes in England. Even a speck of dust may spoil the airflow over the highly polished wings, and flies, clustering on the jets have interfered with measurement of air resistance of jets under test at the Aircraft Experimental Establishment, Farnborough, England.

(Continued to page 8)

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• Practical Accounting

Assignment 1

THE BALANCE SHEET

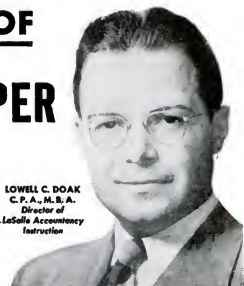


QUOTING from the "Journal of Accountancy," the authoritative organ of the professional accountants of the United States:

"...the accounting profession is probably the best paid in the world. If there is a profession in which the average compensation is highest, it is not known to us. There is need for accountants. There is ample opportunity for advancement. There is no greater field than this which will override the demand within the lifetime of even the youngest of us."

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LOTION WITH THE

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That "WONS"
the Ladies!*

(Continued from page 6)

So, writes Edmund Updale of London, the engineers figured out one way of getting rid of the hitchhiking flies. They fitted paper covers over the leading edges of the wings, where the flies would cling even when the plane was airborne. When the pilot was aloft, he pulled a cord and jettisoned the paper—and any flies still hanging around for the ride.

The stowaway-fly problem has engaged the scientists long enough to amass some fascinating statistics. On one recent test flight in England they calculated that the nonrevenue insect-passenger rate averaged one insect per 10 feet of wingspan. The rate, they point out, is affected by geographical location, time of day, weather and season. In the state of Louisiana, they report, insects are encountered "on every square foot of wing for every minute of flight in the worst 'fly' weather." The flies don't care for high winds or rain, however, or early morning chill. But in warm climates, at low level, they'll ride around on plane surfaces all day just for sheer sport.



Detroit Faces Competition From Canton Center, Conn.

An 18-year-old homemade automobile powered with a Maytag washing-machine engine is still going strong, and the man who built it has handed it down to his son.

The builder, Leonard Bossardt, a garage mechanic of Canton Center, Conn., originally made the car out of an old iron bed frame, parts from a junk yard and a steering wheel from a Model-T Ford.

The power plant, many years older than the car, Bossardt "souped up" when he gave the car to his 10-year-old son, Herbert.

Bossardt, Sr., estimates the car will do over 25 miles per hour. Power is transmitted to the rear wheel by a belt, and Herbert depresses a bar to operate the car.

Letter to the Editor

Your sportsmen readers may like to

(Continued to page 10)

Material From:

**John A. Cox
c/o Hartford Courant
Hartford, Conn.**

POPULAR MECHANICS



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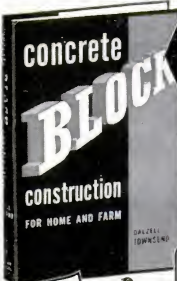
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know how Naval Air Reserve flyers and the Minnesota conservation department cooperated to use heavy weapons of war to save the state's wildlife.

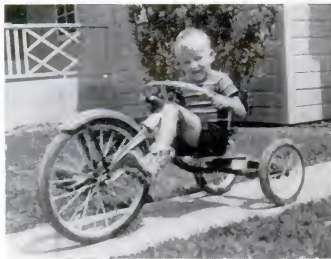
"Operation Whoosh" recently gave our flyers bombing practice with live bombs, and in addition provided 50 much-needed wallows for 5000 moose and the last known herd of caribou in the country.

The enemy, for this bomb run, were small, biting insects. These insects, by attacking big game around the eyes, can blind even a moose, making it easy prey for smaller predators. The only protection for the moose has been to wallow in mud, acquiring a thick, insectproof armor.

So the conservation department asked the Minneapolis Naval Air Station to blast holes in the floating cover of the Red Lake bog area, thus forming new wallows. Operation Whoosh proceeded according to plan, with the enemy making no appearance over the target. Twenty-five one-ton bombs and an equal number of 1000-pounders blasted 50 craters in the bog. Accuracy of the bomb drops was excellent.

The conservation department is well pleased with the results, and so are the flyers. The moose haven't been heard from yet, but observers have seen them investigating the new wallows.

Bill Greer, Lt. Cmdr., USNR,
NAS, Minneapolis, Minn.



Letter to the Editor

I am enclosing a picture of a tricycle conversion . . . accomplished by the very simple operation of turning the main chassis upside down and wiring or bolting an easy-to-make wooden seat in place.

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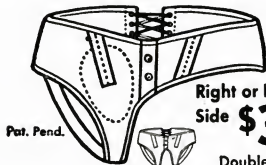
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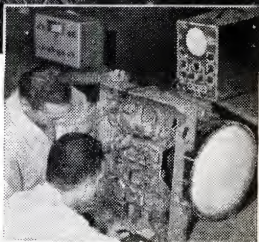
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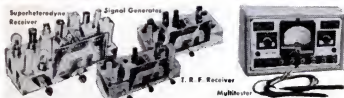
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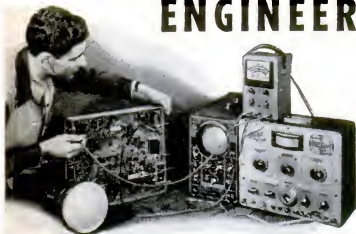
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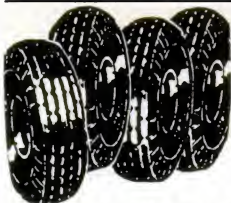
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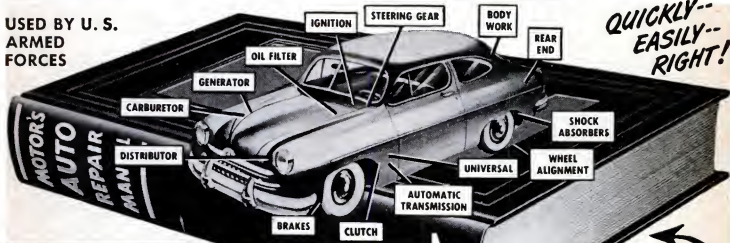
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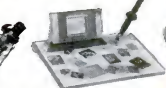
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BURY Home manufacturing business making cleaning compounds, soaps, insecticides, cosmetics, polishes, food flavors. No machinery. Literature free. Kemix, Park Ridge 11, Ill.

\$17.50 CASH Profit. Everyone buys beautiful, new 50 dozen (\$2.00 values). Free catalog. Empire Cravats, Dept. P, 648 Broadway, New York 12.

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MAKE Perfumes at home. Write Carey Laboratories, 1914 Chouteau PM-10, St. Louis 3, Missouri.

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ANYONE Can sell Hoover DuPont nylon uniforms for beauty shops, waitresses, doctors, nurses, etc. In white and colors. Exclusive styles. Top quality. Free price. Exceptional income. Real future. Equipment free. Write fully. Hoover, Dept. S-100, New York 11, N. Y.

\$50 WEEKLY Spare time selling everyday and Xmas cards; personalized stationery, etc. Sample free. Boxes on approval. Victor Studios, 41 West Lincoln Ave., Mt. Vernon, N. Y.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders fast. Pays up to 100% cash profit. Christmas cards with name \$50 for \$1.25 up. Big line. Personal stationery and book matches. Get sample assortments on approval, imprints free. Write today! North Star, W. Glenwood, Dept. A-18, Minneapolis, Minn.

MAKE Wedding profits. Sell invitations; napkins, matches. Samples free. Dunbar's, Middleburgh 3, N. J.

ABSOLUTELY Free big package actual sample fabric, art, stationery, etc. of dresses, lingerie, hosiery, etc. Take orders. Commissions big. Send no money. Melville Co., Dept. 6314, Cincinnati 25, Ohio.

JUST Out! New, thrilling sensation in Christmas cards. Make big money! Show lustre foils, satins, brilliants. Amazing values bring easy orders! Christmas cards with name \$50 for \$1.25 up. Also imprinted book matches, stationery, many gifts. Get 30 free samples with name; several \$1 boxes on approval. Joy Greetings, 507 N. Carroll, Dept. 10, St. Louis 3, Mo.

1000 EMBOSSED Business cards, \$2.50. Velazquez, 696-P Elton Ave., New York 35.

YOUR Own business—Use overcoats 50c; makinaws 34c; shoes 12 1/2c; ladies' coats 30c; dresses 10c. Enormous profits. Catalog free. Moro, 558-A Roosevelt, Chicago.

IS \$210 A week worth a penny postcard to you? Then rush card with name and address for special free trial plan that sells amazing new automatic refrigerator refisters. "Let's Get It" free. Write to Mr. Lewis, D-Frost-O-Matic Corp., Dept. PMC-10, 6 N. Michigan, Chicago 2, Illinois.

BUY Wholesale — 25,000 items. Catalogue 25c. Matthews, 1472-B3 Broadway, New York 10.

300% PROFIT—Postage stamp photos from negative or prints, perforated sheet form, gummed backs. Free details, samples. National Photostamp Co., 1418-J Third Ave., New York 28.

NYLON Uniforms. Immediate delivery. Immediate profits. Sell to doctors, dentists, nurses, waitresses, beauticians, housewives. Free sales kit. Superior Fabrics, Dept. P-10, 3936 Market, Philadelphia 4, Penna.

FREE Samples, and amazing plan, giving you gorgeous dress without penny cost. Rush name today, with dress size. Harford, Dept. E-435, Cincinnati 25, Ohio.

BIG Daily profits—Selling embroidered wool and cotton uniforms, initiated buckles, belts, badges, etc. 3000 emblems. Free sales kit. Hook-Fast, Box 480PM, Roanoke, Virginia.

"HOW Would you like to get paid for "giving away" first quality nylon stockings at 48¢? That's all they cost if they run within guarantee period to three months! Advance cash; big bonus. No experience needed. Just write orders. We deliver, collect. Postcard brings you free sample stocking and sales outfit prepaid. Kendex Corp., Babylon 13, N. Y.

SHINE Shoes without "polish." New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 135, Akron, Ohio.

NEW, Amazing, 25 center. 200% profit. Sample, 10c. Straley; Box 848-C, Soap Lake, Wash.

24 PIECES Service for six. Silverplate tableware. Write. Murphy-Yale, Meriden, Conn.

BUY Wholesale thousands nationally advertised products at big discount. Send free "The Wholesale Plan." American Buyers Service, 629-R Linden, Buffalo, N. Y.

MAKE Money with Merritt. Sell Davis air cushioned shoes; dress, work, heavy duty. Popular priced. Advance commissions. Cash bonus. Experience unnecessary. Write to Geo. Merritt Shoe Co., C-71, Brockton, Mass.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details; sample 10c stamps. Sylvia-PQ, Apartado 9036, Mexico City.

MEXICAN Feather pictures. Terrific Christmas item. Sell gift shops, etc. Adelphi, Box 57-B, Bellerose 6, N. Y.

AMAZING Easy earnings. Make \$3.00 to \$5.00 an hour spare time. Show friends, neighbors our new sight-selling Christmas, everyday cards, wrappings, stationery, gift items. Also get extra bonuses and valuable merchandise prizes. Send today for 30 free imprint samples and boxes on approval, with complete instructions. Prompt service. Bob Arto, Greengate, Dept. L-111, 278 Washington Ave., Chelsea, 50, Mass.

MAKE UP to \$30-\$40 day selling highly wanted Car-V-Pak. Write: Selbyco, Decatur 162, Illinois.

BEAUTIFULLY HAND CARVED inexpensive lucite pin and earring sets, \$7.20 dozen. Knecht chains, \$1.50 dozen. Playdon Ely, 644 29th Ave. South, St. Petersburg, Fla.

RAT-Deth (cheese flavored). Local franchise. Sell big wins. Farm Products, RD, Excelsior Springs, Mo.

DO IT Sell combination hammer-screwdriver set. You buy for 50¢ each, dozen lots, you sell for \$1.00 each, or more. Send \$1.00 for sample today. Maywood Industries, Inc., Dept. F.H., Maywood, Illinois.

25¢ CHRISTMAS CARDS. 35¢ box sells dollar. Two samples dollar. Diehl's, Box 381, Buffalo 3, New York.

UP TO \$75 weekly. Amazing pencil, writes four colors, red, blue, green, orange; sample 25¢; 20 year guarantee given with sample. \$1 size box. Send \$1.00 for metal cap; sample, 25¢, or eight samples, four pencils, four pens, \$1. postpaid. Louis Balogh, 1703M Roosevelt, Valparaiso, Ind.

FALL Sales. Self-propelled rotary mowers, 32". Free catalog. Everything Farm Products, PM, Excelsior Springs, Mo.

NYLONS! New! Fancy heels! Guaranteed! Earn \$1.00 box. Norma Hosley, 833 Columbus Avenue, New York City.

SALESMEN—Add popular, big-profit commission item to your line. Send stores under your label. Get details now. Moore's Products Co., Pleasant Plain, Ohio.

EXTRA Money quick. Sell "NuSilver" polish and plating liquids. Cloth applied. Particulars free. NuSilver, 508-PM10 New York St., Aurora, Illinois.

SELL Hand painted pictures. Size 14x11 inches framed. Price \$6.95 complete. High commission. Box 1000, Realiserve, 110 W. 34, New York City.

SELL Only 50 boxes of Xmas cards and sure sells 35 is yours! Sell to friends, churches, clubs, etc., in spare or full time. Big, beautiful line includes wraps, children's cards, baby cards, novelties, nationally advertised Xmas cards, religious and regular boxes. Sells for \$1.25 up. Stationery, napkins, matches with name-on. Over 100 numbers. Costs nothing to try. Write for free samples on approval. Rainbow Cards, 38-J E. 1st St., New York City 3, N. Y.

SENSATIONAL Money maker, washable wooden slacks, skirts, shirts, plaids and solid colors. No ironing. "Nylon for the forlorn" label. Nylon reinforced, children's, teen-age. Terrific repeat business. Bonus plan. Start immediately. Free sales kit. Wash-Em, Westport 24, N.Y.

SCHOOL Seniors—Earn sensational profits selling classmates America's most beautiful graduation name cards. Largest selection. Outsell all others. Free sample kit. Patcraft, Dept. M, 1425 E. Elm St., Scranton 5, Penna.

Hi-Pro Its. Gifts, jewelry. Free catalogue, details. Pilot Plastics, 67C2 Fulton St., New York City 38.

BE A money maker. Represent magazine, travel around. Wonderful home work. Big Christmas profits now. Liberal commissions. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

OWN A big money-making new and used clothing business. Men's suits, \$2, pants 35¢, topsuits \$1.25, jackets 60¢, shoes 20¢. No experience necessary. Free wholesale catalog. Superior, 1250-A Jefferson, Chicago 7.

SELL Reproductions of world's famous paintings by outstanding Parisian chemist at fractions of original cost. We defy you to tell the difference. Sample free! Exclusive Imports, 1139-H So. Wabash, Chicago 5, Ill. or 6804-H Fountain, Hollywood 38, Calif.

GOLD Lacquered and silver sign letters. Windows, doors, trucks. Standard sizes. Penny each. Free samples. Atlas-P, 544 West 79th, Chicago 20.

BELOW Wholesale. Watches, jewelry, appliances, premiums, silverware, cookware. Collins Company, Forsyth, Georgia.

CHRISTMAS Cards at jobbers prices! Large selection dollar assortments 35¢ each in hundred lots. Imprint cards, money folders, gift cards, pictures, etc. Make more profits selling our line! Catalog free! Three sample boxes \$1.00. Ellico, 438 North Wells, Chicago 10.

FREE Merchandise to new customers (\$1.50 retail value—your selection). Sensational "get acquainted" offer, kush 25¢ for illustrated wholesale bargain catalog and free merchandise certificate. Save up to 50% on 2000 everyday necessities and novelties. Reliable Jobbers, 311-B North Desplains, Chicago.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog, free. Pickcraft, M19 Bank, Attleboro, Massachusetts.

DRESSES, Use 18¢; Coats 22.00, blouses 35¢. Free catalog. Crown, 164-F Monroe Street, New York.

\$50 WEEKLY Selling fine razors blades, other items. Free details, Edison, Department 274, Far Rockaway, N. Y.

NEED Extra cash? Take orders for personalized initials and neckties, cap badges, tie holders, etc. Choose of 3000 emblems. Free sales kit. Hook-Fast, Box 1425PM, Providence, R. I.

PHOTO-Salemen, agents. Sell beautiful hand colored plastic enlargements and sensational new photo composites. Bracelets, lockets, etc. Collect deposit, we deliver. Profitable sideline. Send card, for full details. Photo Portrait Co., 3343 North Ave., Chicago, Ill.

EXCELLENT Sideline for printing and advertising salesmen. Decalomania name plates in small quantities. Great demand. Also add money with your line. Add mobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

AGENTS: Stamping names on key products. Sample 25¢. Sulfids, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—300¢ Profit selling genuine gold window letters, stores and offices. Free samples. Metallic Letter Co., 438-B North Clark, Chicago.

WANTED—Purchasing agents. No money or experience required. Write Dept. C, Purchasing Manager, 2719 Lawrence, Chicago.

SELL Big money-maker to men and women. Easy handwork makes fast-selling useful articles. Sunmade Company, Brockton 44, Mass.

HIGH-GRADE SALESMEN

ESSENTIALUBE—The scientific modern motor lubricant; that lubricates as it cleans. It is its powerbase. Nech mechanically inclined men above thirty to tell its astounding story to farmers and machine owners from coast-to-coast. Must have car and auto field. Selling for full commission. Manager. Liberal drawing account, quarterly and yearly bonuses, high commissions. Rapid advancement for good men. Write at once, giving full qualifications to Petroleum Division, Box 382, Dallas, Tex.

SALESMEN—Get happy! Hundreds different things to sell; all details free! Write what you sell now; what you'd like to sell. Your mail box will run over! Salesmen's Service, Dept. 1711, Fort Worth 12, Tex.

UP TO 65¢ profit with the best line of automatic fire protection. Red Ball Inc., Box 1552, Salt Lake City, Utah.

UP TO \$50.00 in a week spare time and tailored suit for yourself without paying one cent. Write for plan and free sample case. Pioneer Tailoring Co., Congress and Throop, Dept. Y-1117, Chicago 7, Ill.

EARN Big money fast! Sell finest-quality advertising work uniforms to garages, factories, filling stations, etc. Free selling kit. Topps, Dept. 5310, Rochester, Ind.

ADVERTISING Book matches—Cash on big demand; sell union label matches. Cash for all businesses and political groups. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Write for details. Superior Match Co., Dept. M-1051, 7530 Greenwood, Chicago.

A Pair of shoes as bonus. Big money making shoe line. Men's, women's dress, work shoes and boots. Newest spring-step cushion construction. Lighter, softer, longer wearing. Free sample. Orho-Vent, M-1051, Salem, Virginia.

"PENSILUBE" New scientific lubricating pencil for home, shop, office. Salesmen write Reardon Products, Peoria, Illinois.

GO into business for yourself. Make storekeepers' profits without storekeepers' troubles. We'll put you into the highly profitable, always steady shoe business, furnish everything, train you to sell direct to women, and wages to high. Hardly write, your investing one penny. We'll work to make you a success. We've done it for others. We'll do it for you if you are honest, ambitious and willing to work hard. Write us. You'll hear from us at once with facts. Address Manager, P.O. Box M864, Chipewala Falls, Wisconsin.

ENJOY Tremendous profits selling Christmas displays. Annual cleanup for hustlers. Literature free. ADPro, Box 562-PM, Springfield, Illinois.

TAXI, Bus, truck fleets buy on sight. Lieke-Kleen oil saver. Eliminates crankcase sludge. Prevents oil leaks. Money back guarantee. \$10.50. Clothier, 131 S. Washington, Wilkes-Barre, Penna.

WANT To make real money? You can positively make \$50 a day and up selling a brand new line going for a variety of food and beverage stores, factories, laboratories, hospitals, etc. First time advertised. Write for free details today. Johnson-Hartman, Dept. 1, Jackson Blvd., Dept. PM-10, Chicago 4, Illinois.

AD Matches! Sell amazing designs—20, 30, 40 and 240-light book matches. Bigger spot cash commissions; every business a prospect. Low prices. No experience. Repeats. Start without experience; men, women; full, part time. Buy nothing! Sales kit furnished. Match Corp., Dept. PM-22, Chicago 24, Illinois.

NEW Year party packages. Hat, blow-out, noisemaker, streamers, balloon. Profit plenty. Eliswood's, Pueblo, Colorado.

MAKE Money showing neighbors how to beautify yards with glorious flowering shrubs and trees. Free literature. Award fruit trees; world-famous Stark patented varieties produce abundant harvests champion-quality apples, pears, peaches, other fruits. Even small plots produce fruit for family-use and to sell. Beautiful sales kit free. Stark Bro's, Dept. 30182, Louisiana, Mo.

A Fine income, your own nylon free! Show nylon line, line men's socks with amazing free replacement guarantee against runs, snags, tears. Write for free sales kit. Group organizers invited. Rose-Lee, Dept. 1, Union City, N. J.

SALESMEN, Money-making sideline. Calendars and advertising specialties. Highest commissions advanced. Free new cards. Rush name. Advertising Specialties Manufacturing, Brooklyn 36, N. Y.

MAKE Money with famous, easy-selling Bostonian shirts—spare time, full time. Sideline. Fabrics, outfit free. Bostonian, 89 Sackford, Dept. G-10, Boston 30, Mass.

NEW Jobs open in selling! Send name, address for free literature. Published by Magazine's money-making guide, listing hundreds of companies who'll pay you well, full or part-time. No experience needed. Opportunity, 28 E. Jackson, Dept. 17, Chicago 4, Ill.

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PRACTICAL Nursing—Learn easily at home, spare time. Big demand, good earnings. High school not necessary. Write for facts. Wayne School, Dept. FG-3, 2525 Sheffield, Chicago 14, Ill.

LEARN Auto and diesel mechanics, welding, lathe, auto body repair. New classes weekly. Veterans discharged after July 24, 1947, and oldest school—50% benefits. Request catalogue. Hanson Mechanical Trade School, Box 1780-M, Fargo, North Dakota.

LEARN Auctioneering at home working with successful auctioneers. Realistic method provides classroom training in spare time. \$100.00 daily often earned by trained auctioneers. Advance Auction School, 5644 North Newark, Dept. 203, Chicago 11.

PIANO Tuning pays. Learn this profitable profession at home. Our Tonometer and mechanical aids make learning easy. No knowledge music necessary. Diploma granted. Largest and oldest school—53rd year. G.I. approved. Write for booklet. Niles Bryant School, 78 Bryant Bldg., Washington 16, D. C.

LISTEN And learn a language by Lingaphone. At home, correctly, correctly master Spanish, French, German, Russian, Asiatic—any of 29 languages through Lingaphone Conversational Method. Add to service, job advancement, travel preparation for free. Approved for Veterans' Training. Lingaphone Institute, 8310 Rockefeller Plaza, New York 20.

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BOOKKEEPERS—What you should know about a bookkeeping service. 25c. James, Box 1281, Lubbock 23, Texas.

YOU For president of your own credit-collection business. Many who answered our ads now have their names on office down Franklin Credit, Roanoke 7, Virginia.

BE A real estate broker through home study or classroom instruction. Write for free book. Approved for Veterans. Weaver School of Real Estate, R. E. Pershing Rd., Box CP-10, Kansas City 8, Mo.

PREPARE For civil service examination, pay for course after securing position. Write, Free School, Dept. PM-10, Kokomo 3, Ind.

MAKE UP to \$45-\$55 week as a trained practical nurse. Learn quickly at home. Booklet free. Chicago School of Nursing, Dept. M-10, Chicago.

HAIRCUT As you like it. Booklet tells how. 25c. Mastrolia, 514-BB Jane, New York City 14.

LEARN Technical metaphysics. Insure success in life. Valuable information. Canada School of Technical Metaphysics, 2532 McKenzie St., Vancouver, B.C., Canada.

WAKE UP your winning ability. Activate your idle success powers. End money worries. Get ahead. Enjoy living. New thought-control behavior-mastery method gets results in every case or no cost. Details sent free. School of Personal Psychology, 1008 Washington Blvd., Louisville 2, Kentucky.

LEARN Naturopathic medicine and laboratory technic, 1410 Central, Kansas City, Missouri.

HIGH School—No classes. Study at home. Spare time. Diploma awarded. Write for catalog. HP-13, Westwood School, 2527 N. Sheffield, Chicago 14, Ill.

WELDING Training pays at Hobart Welding School, Box M-1012, Troy, Ohio. VA contract. Best equipment. Catalog free.

INCREDIBLE! Unprecedented! Look up "Miscellaneous" Bijou, Box 1727-MG, Hollywood 28, California.

U.S. Civil service jobs! Men, women, 50,000 jobs open now! Start high as \$66.34 week. Experience usually unnecessary. Quality now! Get free 32-page book showing jobs, salaries, requirements, sample tests. Write Franklin Institute, Dept. B-24, Rochester 4, N. Y.

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USED Correspondence courses and educational books bought, sold, rented. Catalog free. Educational Exchange, Summerville, Ga.

SCIENCE Of memory amazingly simplified. New book. Information free. Memory Studio, 2016-M Sunnyside, Chicago 25, Illinois.

INVESTIGATOR Training. Phillips Secret Service System, 1917-B North Kenneth, Chicago 39.

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300 PROJECTS You can make in Popular Mechanics 32-page Blueprint Catalog. Send for stamp and story. Popular Mechanics Press, Dept. BP, 200 East Ontario St., Chicago 11, Ill.

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"HOW To write and sell magazine articles" by actively selling writer, 24-page folio, \$1. Murphy, 1312 Lakeland, Lakewood, Ohio.

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I Want new writer? Cash checks of \$1 to \$100 offered daily. (The easiest way to write for pay. No previous experience necessary. Free details. Saunders M. Cummings, 468-11 Independence Bldg., Colorado Springs, Colo.

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LETTERS Retailed 25c each. 8 scenic postcards \$1.00. Stadler, Box 2335, Hollywood 28, California.

ANY Information on Chicago area \$2. Information, 222 Coe Road, Clarendon Hills, Illinois.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

ARTISTIC Back dated Art Magazines. Eight \$1; 36 \$3.50 postpaid. Art bargains. Catalogue 10c. Art Book Shop, Arnold 58, Missouri.

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ORIGINAL Drawing. Learn and earn at home. Free drawing kit offered. Pacific Art Institute, Box 1284, San Jose, California.

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STUDY Showcard art. Free details and Strok-O-Graf. Midwest Art School, Fort Wayne 2, Indiana.

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FREE Radio advertising. 400 of the 2800 radio stations throughout the U.S. will advertise your product for just a small percent of each sale, instead of a set fee. For a booklet containing the names and addresses of those stations plus all other information, send \$5.00 to Letts Advertisers, Frankfort, Illinois.

OUR Mailing lists. Individuals, firms, dealers, jobbers; on stickers. Reasonable. Write Gaunt Industries, 827-L Irving Park, Chicago 13, Ill.

FREE COPY layout service. Mailorder ad, 1,700,000 nationwide circulation. 125,50 inch. 24-word classified. 20 big Sunday newspapers. \$30.00. Advertisers ratebook free. Chicago Advertising Agency (established 1900), Chicago 4.

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ADS Placed in out of town newspapers and magazines. Low rates. Catalogue free. Ideas that pay. Baker Advertising Agency, Successors Ankrum Agency, 189 W. Madison, Chicago 2.

ADVERTISERS! Reach nearly 18,000,000 readers. 25 Sunday national key newspapers, 18 words. \$59.00. "Terrific pull"—20 popular newspapers \$11.50. Free booklet. Special—One inch display 2-821.198 circulation. \$51.10. Newmark's Advertising Agency, (Established 1893), 217-7th Ave., New York 11.

MAILING Lists: \$5.00-1000 up. Write Dixie Service, King, N. C.

24 WORDS in 50 weeklies. \$4.96. J. Darnell, 730 Hays, Jackson, Tenn.

ADVERTISE: 24 Words, 40 newspapers \$3.50. Lists free. Advertising Bureau, 10611-C Springfield, Chicago 43.

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TYPEWRITERS. Duplicators, adders. Slashed, liquidating. Typewriters, 118 Spruce, Wichita 7, Kansas.

PRINTOMATIC Self-feeding post card printing duplicator \$15.75. Envelope addressing machines \$24.50. Pittsburgh Typewriter Company, 336-R Fourth Avenue, Pittsburgh 21, Penna.

RECONDITIONED typewriters, printing devices, office machines, equipment. DixieGraph, King, N. Car.

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3 LINES 50c; Pads 35c; signature \$2. Stampright, Wauwatosa, Wis.

PICTORIAL Rubber stamps (sample, 17 star, 50c). Stampico, 8835 Quincy, Detroit 4, Mich.

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QUALITY Printing. Samples, prices free. Thompson, Box 164, Mattapan 28, Mass.

ENGRAVED—Effect, process embossed business cards, \$3.95 thousand. Samples free. Universal Line, PM-1, Orange, Mass.

50 LETTERHEADS With envelopes, \$1.00. Benneville, Box 1931, Pittsburgh 30, Penna.

QUALITY Printing. Booklets, publications, circulars, stationery. Free price list. Adams, 30 West Washington, Chicago 2, Illinois.

MIMEOGRAPHING Letters, price lists, formulas, instructions. Lowest prices. Tom Rosson, Big Spring, Texas.

100 ENVELOPES Printed 2-colors \$1.25. Box 523, Rochester 2, N. Y.

100 LETTERHEADS (8½x11 Hammermill) \$1.00 postpaid. Envelopes, business cards same. Race Printers, Hudson, New York.

BUSINESS Printing. Samples, prices, free. Howprint, 723-M Eunice Webster Groves 19, Missouri.

DISTINCTIVE Business cards economically priced. Free samples. Roscoe M. Heavener, Colmar, Penna.

125 8½x11 LETTERHEADS And 125 6½x9 envelopes \$2.00 postpaid. 250 of each \$3.50. Going Print Shop, Box 1544A, Muskogee, Oklahoma.

FREE Samples, prices. Quality work. Remold. Fast service. Sutton Printing, 341 State, Waycross, Georgia.

100 8½x11 LETTERHEADS. 100 Envelopes, \$2.00. Samples. Fairlyprint-P, 205 Cedar, Kingsport, Tennessee.

PRINTING—5000 5½ x 8½ Circulars \$18; 3½ x 5½ \$8.25; folders, books, everything. Garrison Press, Harrisonburg, Va.

1000 BUSINESS Cards \$2.50 prepaid. Samples free. Reliable Print Shop, 907 East Jefferson, Louisville 6, Ky.

SAVE On distinctive two-color business stationery. Samples \$3. Gardner Press, Costa Mesa, California.

100 8½x11 HAMMERMILL Letterheads and 100 envelopes, \$2.10. H. Hudson, Centredale, R. I.

MIMEOGRAPHING—Reasonable. Any copy. Malters Service, Box 606-B, Chicago 90, Ill.

SEND 10c Now for our 48 page 1951 price list—refunded first order. McCall Press, 1326 South 27th, Omaha, Nebraska.

MIMEOGRAPHING—Letters, price lists, formulas, instructions. Lowest prices. Lem's Letter Shop, 5710 Stanton, Detroit 8.

500 3¼x7½ FOUR Line gummed stickers 50c. Red border \$1.00. Moritz Printery, Saginaw, Mich.

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MAKE Your own rubber printing cuts. Self-molding process. Plexirubber, Argyle 1, Wisconsin.

CAPABLE Home-built press, details free. Roberts, Box 184-a, Walpole, Mass.

PRESSES. Type, cabinets, supplies. List for stamp, Lincoln Press Company, 230-A Hartford, Fall River, Mass.

PRESSES, Supplies, paper. Catalog 10c. Custom, Box 211-P, Springfield, Missouri.

PRINT Your own cards, stationery, circulars, advertising. Save money. Simple rules. Print for others, nice profit. Raised printing like engraving too. Have home shop. Details free. Kelsey Presses, L-11, Meriden, Conn.

PRINTING Presses, type, supplies. Lists 3c. Turnbaugh Service, Loxysville, Penna.

PATENT ATTORNEYS

INVENTORS: Learn how to protect your invention. Understand the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U.S. Patent Office and prepared to serve you in handling your patent matters. "Patent Guide for the Inventor" containing detailed information concerning patent protection and procedure with "Record of Invention" form will be forwarded to you upon request; without obligation. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 11B-K District National Building, Washington, D.C.

PATENTS—If you have a valuable invention, you are advised to authorize a preliminary search through appropriate classes of United States Patents. This firm is registered to practice before the Patent Office, and is available to make such search and report to you concerning the probable patentability of your invention. Instructive booklet with "Evidence of Invention" form sent upon request. Victor J. Evans & C, 631-L Merlin Building, Washington 8, D.C.

INVENTORS—If you believe you have an invention, you should find out how to protect it. The firm of McMorro, Berman & Davidson with offices in Washington, D.C., is qualified to take the necessary steps for you. Send for copy of our patent booklet, "How to Protect Your Invention." We will also send you an "Invention Record" form. No obligation. They are yours for the asking. McMorro, Berman & Davidson, Registered Patent Attorneys, 1347 Victor Building, Washington 1, D.C.

HERMAN Lewis Gordon, registered patent attorney, patent investigations and opinions. Warner Building, Washington 4, D.C.

INVENTORS—For "Invention Record" form, contact Carl Miller, Registered Patent Attorney, Woolworth Building, New York.

REGISTERED Patent attorney offers services. Sanders, 6430 Evans, Chicago 37, Ill.

INVENTORS: When you are satisfied that you have invented something of value write me, without obligation, for information as to what steps you should take to secure a patent. Write Patrick D. Beavers (Formerly Randolph & Beavers) Registered Patent Att'y., 935 Columbian Bldg., Washington 1, D.C.

PATENTS. "Proof of Invention" folder mailed without obligation. E. E. Vrooman, Registered Patent Attorney, 507 McKim Building, Washington 5, D.C.

INVENTORS: Write for free brochure "Evidence of Invention." Labiner, World Building, New York 38.

C. Snow & Co.—M-427. Snow Building, Washington 1, D.C. Registered Patent Attorneys. Write for information.

INVENTORS: Without obligation, write for information explaining the steps you should take to secure a patent. John N. Randolph, Registered Patent Attorney, 203 Columbian Bldg., Washington 1, D.C.

PATENTS—Irving L. McCathran, 315 McLachlen Bldg., Washington 1, D.C. Registered Patent Attorney.

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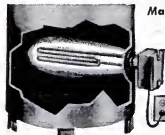
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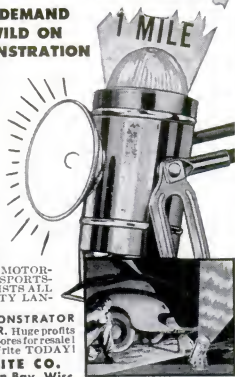
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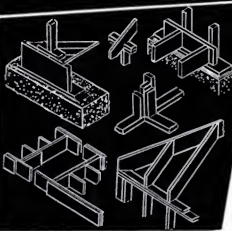
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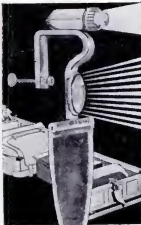
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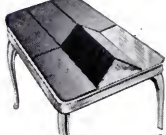
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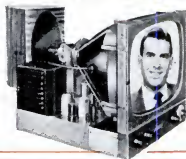


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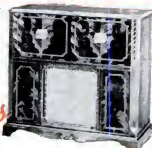
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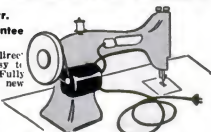
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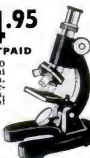
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VOL. 96 NO. 4

Air Support is the G.I.'s "Sunday Punch"

By Thomas E. Stimson, Jr.

SNOOPER, THIS IS Crankcase Easy. We are under heavy mortar fire from the ridge in front of us. We are setting out a cloth arrow to guide you. Can you help?"

Crankcase Easy listened to the terse reply — "Roger. I see your arrow" — and then continued: "Ask the pilots to be careful. Our boys are only a hundred yards away."

Moments later there was the rumble of a jet overhead and the tearing scream of a rocket. The troublesome ridge exploded in a cloud of smoke. Two more F-84s slanted down toward the target and more explosions followed.

In the light "Snooper" liaison plane that was cruising over the battle area, the air control officer watched his planes make their strike and then circle back to rejoin their group. He peered toward the ground again as another call came in, reporting that several hundred of the enemy had just concealed themselves in a near-by railroad tunnel.

He had a cure for that. He called for one of his flying flame throwers, a plane that

Ground troops watch as an F-84 loaded with bombs and rockets aims at enemy 100 yards away

carries drop tanks loaded with jellied gasoline. The pilot and the flame thrower circled once to choose the best approach, then went in low and fast and dropped one tank. It was a perfect hit. The fire bomb exploded in the entrance and flames poured out of both ends of the tunnel. Not an enemy escaped.

Close air support of ground troops is a spectacular kind of fighting that paid off 1000 percent in Korea. Aircraft are faster than tanks, more versatile than artillery. They can wipe out practically any kind

One airborne 5-inch rocket knocked this tank out of action after it broke through an infantry regiment





Napalm dropped from a Corsair, partly obscured by smoke, burns out an enemy position blocking a U.N. advance

of target. They are the doughboy's "Sun-day punch."

To make this wallop even more effective, the United States has taken the surprising step of ordering quantity production of an English-designed twin-jet bomber, the Canberra, from the Glenn L. Martin Company. This is the first time since 1917 that an American firm has gone into mass output of a foreign-conceived plane. Crewed by two or three men and only slightly larger than some fighters, it combines the low-level maneuverability of an interceptor with the bomb-carrying potency of a big plane. A model flown here from England for tests crossed the Atlantic nonstop in less than five hours. The Canberra's U. S. Air Force designation will be B-57.

Martin is continuing development of its own light jet bomber, the XB-51, and a four-jet North American Aviation design, the B-45 Tornado, has been in action in Korea. Its primary mission, however, has been reconnaissance. The Boeing B-47 Stratojet is likewise capable of effective support roles.

The usual close-support team has three elements: Several forward ground observers distributed along the fighting lines, who ride in radio jeeps or carry portable radios; a small liaison plane that cruises around as slowly as 30 miles per hour at a safe altitude so that the air control officer on board can study the terrain and locate the points described to him by the ground, and a group of support planes in the air some distance from their potential targets.

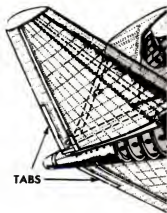
These planes are always on call, loaded with combinations of light and heavy rockets or bombs or napalm tanks, plus their standard armament of machine guns or 20-

mm. cannon. The control officer may call for one of them or several, depending on the size of the target.

The napalm fire bomb is one of the most effective weapons the support aircraft carry. Napalm is gasoline that has been chemically thickened or "jellied" so that it coats everything it touches with fire that burns at 3000 degrees. Pronounced "napalm," its name comes from a formula that consists of aluminum naphthenate and fats from coconuts. It was used in the Pacific late in World War II.

The ordinary wing-tip tanks of jet aircraft can be converted into fire bombs by filling them with napalm and screwing a white-phosphorus igniter into the filler-cap opening. Smaller tanks of as little as 90-gallon capacity are carried under the wing and seem just as effective as the larger tanks. A napalm bomb can spread fire over half an acre of ground, and the fire burns long enough to incinerate everything it touches.

All the support aircraft carry grid maps of their battle area so that a pilot can locate the general vicinity of a target when the control officer reels off a string of coordinates to him. If a pilot can't find his exact target the control plane may mark it for him by firing a smoke rocket right into it. After dark a control plane sometimes points the way to a target with its landing lights. In any crucial battle the support planes are apt to work all the way around the clock, using parachute flares to



illuminate the entire terrain after dark.

In one 13-day period in Korea, Navy and Marine aircraft fired 393,000 20-mm. shells, 9616 rockets, 601 tons of bombs and 608 napalm fire bombs against ground targets. Panther jets, Corsair fighter bombers, and Skyraider dive bombers were the aircraft employed.

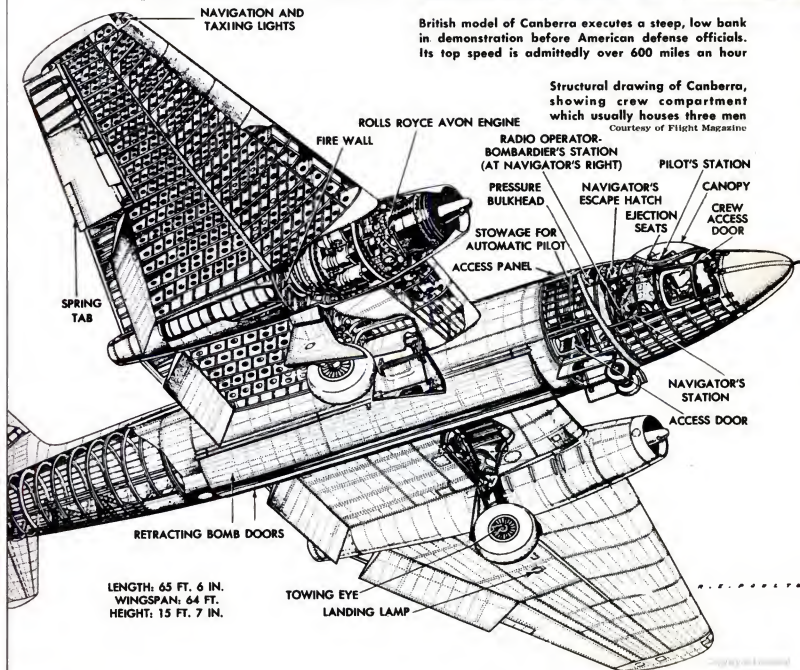
In a 52-day period the Air Force's B-26s, F-51s, F-80s and F-84s made more than 100 strikes a day and fired a total of 32,000 rockets and 500,000 gallons of napalm. More than 250 enemy tanks, 5000 vehicles and 500 gun and mortar positions were silenced.

Support like this is possible only when we have control of the air. This was obtained early in the Korean campaign. Enemy jets that threatened the support craft were shot down or driven away by squadrons of F-86s.

But the pilots who fly support don't lead the safest lives. In their eagerness to knock out a target they sometimes approach so closely that they are hit by fragments of their own exploding missiles. Enemy anti-aircraft and small-arms fire are other hazards. Even if a plane is hit and crashes behind enemy lines, there's a good chance that the pilot can be rescued if he is still



British model of Canberra executes a steep, low bank in demonstration before American defense officials. Its top speed is admittedly over 600 miles an hour





When help from the air is needed, close teamwork between ground controllers and air coordinators pinpoints targets for the planes

FORWARD GROUND CONTROLLER

alive. Helicopters went deep into enemy territory time after time in Korea after flyers and brought them back, while all the available support aircraft in the district circled around the downed plane to keep the enemy from approaching.

Tactical air operations consist of supporting the ground troops in the battle area

and also in ranging far behind the lines to prevent more men and supplies being brought into the fight. The sum result is that the enemy rarely has risked large-scale transport in the daytime, in good weather. Most of his men and supplies move forward in bad weather or after dark.

To keep our planes away, the enemy tried manufacturing his own bad weather in the battle areas. Brush piles were set on fire and thousands of smoke pots used, obscuring a whole region with haze and smoke. This was a hindrance to close air support. Yet any site that is especially protected by thick clouds of smoke can be presumed to contain an important target.

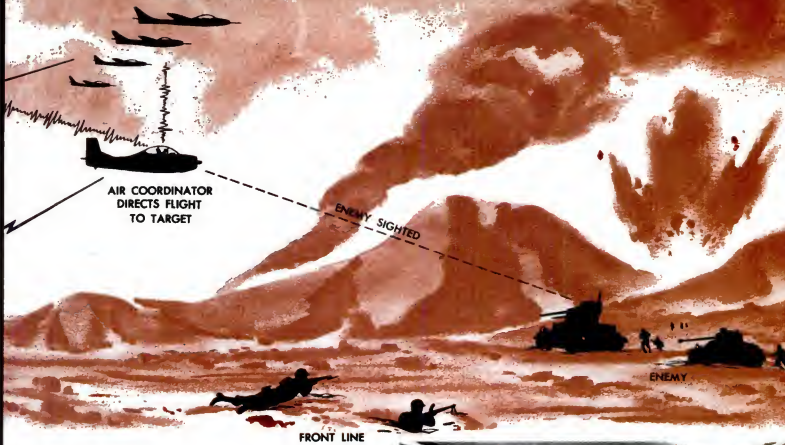
It gets a thorough working over.

How to keep enemy trucks from moving after dark has been a problem because most of north Korea is mountainous, hence extremely dangerous to low-flying aircraft. If a convoy is discovered and a parachute flare dropped to light it up, night-flying pilots may still crash into a peak while circling into position. A lot of the convoys get through but not all of them, for the Air Force has found a new way of

Each high-velocity rocket in this salvo has a destructive capacity equivalent to that of a shell fired from a 5-inch naval gun



POPULAR MECHANICS



stopping them in spite of these obstacles.

Night after night when the air was clear enough for photography, Air Force photo planes would fly on night patrol above the main highways and secondary roads that the enemy might be using. The trucks they hunt are blacked out, yet occasionally a convoy leader has to use his headlights on the mountain curves. When a photo pilot sees a momentary blink of light below or catches anything else that suggests activity he opens his camera and sets off an aerial flash, getting a sharp image of the ground on his film. On a busy night with a number of aircraft aloft pilots report seeing flashes from all points of the compass.

Back at the field the films are developed and inspected while still wet to determine whether any of the road traffic is so important that a light bomber should go out at once, with flares. If not, the convoys that are spotted on the films can wait until the next morning.

Meanwhile the distance that any convoy should make before it goes into hiding in the morning is calculated, and from other aerial photos and from maps an estimate is made of where the convoy will spend the day. In the morning a plane is sent to that spot to finish off the convoy.

It isn't always that easy, of course, and yet time after time a support pilot with the correct information has been able to fly far behind the lines, locate a particular clump of trees alongside the correct road, and find

(Continued to page 244)

Cloth panels laid out in the form of an arrow by foot soldiers lead Marine flyers to a hillside target. Smoke rockets are also used for indicating targets



Attaching warhead to a 5-inch rocket under the wing of an F-84. These and napalm are two of the most deadly agents used in close support of troops





Bell Telephone Laboratories

"Master Timekeeper"

Probably the most precise in existence, a new "master timekeeper" at the Bell Telephone Laboratories is expected to vary less than one second in 30 years. It will be used to monitor equipment for coaxial-cable and radio-relay television and telephone networks, and to control radio-network switching clocks. The secret of its precision is four extremely stable quartz

crystals which vibrate constantly at a frequency of 100,000 cycles per second. They control the frequency of a special electric current with a precision of one part in a billion. Power for continuous operation is supplied by storage batteries, with a steam-driven generator available for charging the batteries indefinitely in emergencies. The clock, which took five years to design and build, has about 600 electron tubes and more than 25,000 soldered connections.

Powder "Painting"

Out in the Nevada desert not far from famed Death Valley, Mrs. R. B. Cothern is "painting" colorful landscapes with materials that she finds in nature. The Arizona hobbyist gathers samples of minerals in the surrounding country side. These samples are ground to a fine powder with a small mortar and pestle. By carefully pouring the ground minerals into a narrow air space between two parallel panes of glass, Mrs. Cothern "paints" her pictures in beautiful colors. She also uses two glass tumblers, one smaller than the other. By nesting the tumblers she makes a narrow space between them which becomes her "canvas." A circular metal ring seals the top of the tumblers when her picture is finished. The minerals are so tightly packed they do not shift.



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Propane Barge

Believed to be the first ever built for the purpose, a 195-foot barge now carries propane over the sea lanes. Its six tanks store

360,000 gallons of low-pressure gas — the equivalent of a 35-car trainload. The tanks consist of cylindrical sections welded together to withstand the pressure under which propane must be stored.

Signal Corps Transmits Maps and Photos by Facsimile

Maps and photographs of front-line troops will be sent anywhere in the world in minutes with a facsimile machine developed by Army Signal Corps engineers. Under proper conditions, the new machine will send copy twice as fast as any previous system. Three degrees of definition are possible, depending upon communications and the type of material being transmitted. In addition, the facsimile machine can be used to cut mimeograph stencils automatically as it receives, thus making hundreds of copies available within a few minutes of receipt.



Air-Filtering Material Available in Rolls

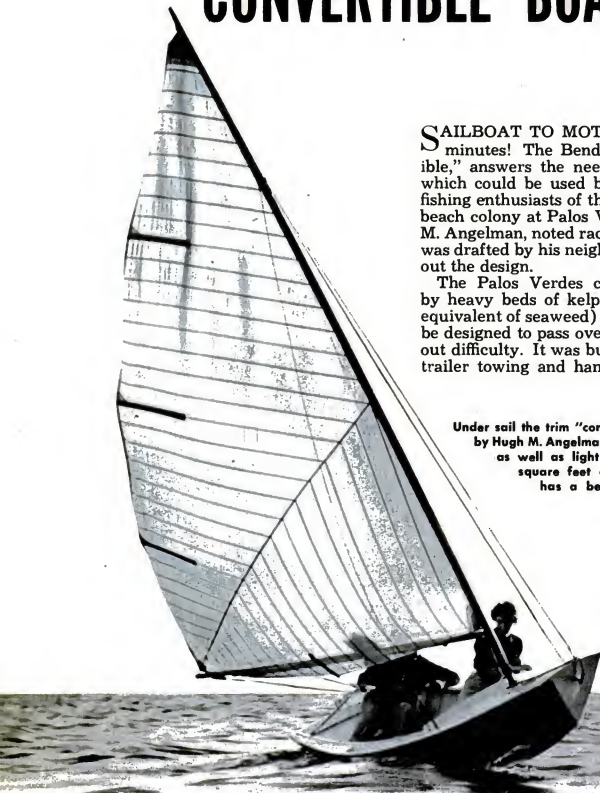
Available in roll form, glass-fiber material enables the user to replace air-filter elements without having to pay the cost of a frame each time. The material comes in one and two-inch thicknesses and is cut to size with scissors or shears. Coarse wire screening, similar to poultry wire, is used to support the filter material and it is left up permanently once installed. After the initial installation, only the filter material has to be replaced periodically.

"CONVERTIBLE BOAT" has

SAILBOAT TO MOTORBOAT in three minutes! The Bendy, a new "convertible," answers the need for a small boat which could be used by both sailing and fishing enthusiasts of the Portuguese Bend beach colony at Palos Verdes, Calif. Hugh M. Angelman, noted racing-yacht designer, was drafted by his neighbors there to work out the design.

The Palos Verdes coastline is fringed by heavy beds of kelp (the West Coast's equivalent of seaweed) and the boat had to be designed to pass over this growth without difficulty. It was built light for ease in trailer towing and handling on the dock,

Under sail the trim "convertible" craft designed by Hugh M. Angelman handles easily in heavy as well as light winds. She carries 97 square feet of canvas and her hull has a beam measuring 5½ feet



Shown in down position, centerboard of the Bendy rises and falls as the boat passes over kelp beds



Close-up of the centerboard structure. The keel is dropped down through slit by means of a small rope



a FLOATING CENTERBOARD



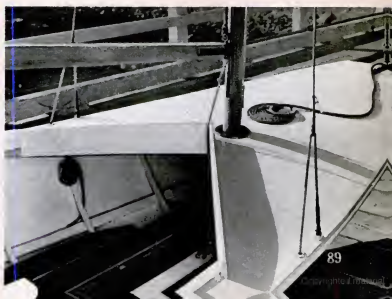
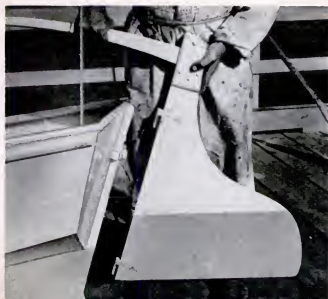
Californians Susan Shaw, left, and Tony Mull enjoy a speedy ride, powerboat style, in the convertible Bendy

for there is a lack of mooring facilities at the colony and the boats are lowered into the water by an electric winch. Mast, boom and rudder were made quickly detachable so that an outboard motor could convert the boat into a power launch for fishing. In addition, the boat had to be safe and easily managed since it would be used by children. The Bendy has inspired over a dozen colony boatbuilding "bees" already. Angelman's boat has a lightly balanced sweptback centerboard, a blunt, stubby nose and a rudder flush with the keel. It was given a gently curving hull with a five-foot six-inch beam without reducing the sailing speed. The Bendy has an 18-foot mast and an 11-foot boom. Having only a mainsail, it carries 97 square feet of canvas. Its free-floating centerboard, 48 by 14 inches and weighted, hangs loosely out of the bottom of the boat, rising and falling as it passes over the kelp beds. The stern and bow are of mahogany; the ribs, centerboard trunk, keel and chine are of oak, and the remainder of the boat is of plywood.

Rudder used in soiling version was designed flush with the keel, so it wouldn't become fouled in kelp



Her lightweight construction simplifies lifting the craft out of water for land storage when not in use. Below, in two minutes the mast, stays and boom can be removed, converting boat to outboard-motor use





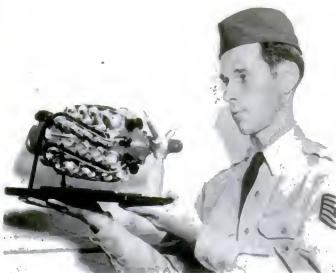
Pilots Get a Lift Before Take-Off

Jet pilots on the aircraft carrier USS Oriskany are riding to work now on an electric stairway. Formerly they had to rush up a long flight of steps, carrying 40 pounds of equipment, in order to keep up with the split-second flight schedule. Moving stairways are being installed on five other aircraft carriers.

Cortisone Made From Mexican Yams

Developed in Mexico, a practical method of making the antiarthritis hormone, cortisone, from a wild root promises to make this wonder drug more plentiful in the future. There are 22 steps in the operation, but it is practical enough to make it commercially feasible. A new industrial plant to produce the hormone in Mexico is expected to be in operation early in 1952. The root grows wild in Mexico, but it has been placed under cultivation to assure a continuing supply, and is now being grown in Puerto Rico as well as in Mexico. Formerly, the only known source for cortisone was bile from ox and sheep, limited by-products of slaughterhouses.

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Aircraft Engine Built to Scale

Only 14 inches long, a scale model of the 28-cylinder Pratt and Whitney "Corncob" aircraft engine was built by Air Force T/Sgt. Ladd L. Canney at Hickam Field in Hawaii. The engine on which the model was based is used in the giant Boeing Stratofreighter, a mainstay in the Pacific air lift. The model was displayed at Hawaii's 49th State Fair.



Portable Stroboscope

Using a cold cathode triode tube, a compact stroboscope provides a portable light source for servicing and testing motors, timers and other devices using synchronous speeds. No warm-ups are required, the light being instantaneous when the button is pushed. It plugs into any standard a.c. outlet and rectifies the line course, giving off a pulse of light only during the positive portion of the cycle.

From Cars To Bazookas

Everybody who works at the Oldsmobile automobile factory doesn't work on cars these days—some are producing 3.5-inch rockets for the Army's superbazooka. Part of the Oldsmobile engine plant is being used to produce the high-explosive antitank head, practice head and various other parts of the rocket. After completion of the parts, Oldsmobile ships the rockets to a loading plant where the propellant and explosive are added. The big bazooka rocket penetrates heavy armor plate upon impact.



Gearless Single Seater Ideal for Amputee Driver

Built by a German racing driver, Egon Bruetsch of Stuttgart, a single-seater car is said to be ideal for amputees. There are no gears or shifting, the clutch being operated by centrifugal force. The top folds back to permit easy access to the driver's seat. Being small, it is easy to handle in city traffic. Economical, the 15-cubic-inch engine drives the light car 70 miles on a gallon of gasoline and at a top speed of 50 miles an hour. Bruetsch estimates the cost of the small vehicle will be in the neighborhood of \$450.

"Can Opener" for Tires

Operated like a can opener, a new lever tool mounts or dismounts auto tires. The handle of the tool is pushed up and down around the rim of the wheel to take the tire off or put it on again. It was developed in Germany.

Carbon has a higher melting point than any other substance. At 6300 degrees F., carbon turns to vapor without going through a liquid stage. Because of its high melting point, crucibles of graphite, a form of carbon, are used to melt other materials. Tungsten has a melting point of 6098 degrees F., the highest of any metal.





MONOGRAM PLE



INVERTED TX



HASH KNIFE



TURKEY TRACK



SHAVING MUG



LONG X



N BAR



HORSESHOE BAR

CIRCLE
DIAMOND

HOURLASS



U LAZY J



ANTLER



MILL IRON



MALTESE CROSS

Rustlers still can't resist temptation of a fortune along open highways
Bureau of Reclamation photo

THE NEW WEST STILL FIGHTS RUSTLERS

By Rafe Gibbs

FAT AND SLEEK, the two-year-old heifer munched grass along the timbered fringe of Idaho's Primitive Area. A rifle barrel slid through the forked branch of an aspen. A shot was fired, and the young cow doubled up, kicking.

From behind the aspen stepped a red-shirted deer hunter — without deer, but with fresh meat on the ground. Quickly, the man slit the heifer's throat with a hunting knife, then proceeded to skin and carve

choice cuts from the animal, leaving the rest for the coyotes.

This is a scene that is being enacted frequently — too frequently — in the West today.

Sheriff Guy Cash of Nezperce, Idaho, told us:

"The hunter who doesn't get his deer is our biggest cattle-rustling headache in these parts. Deer hunting is good, but not good enough to assure every hunter veni-



son in the pot. Out alone in the brush, a man—a weak man, that is—gets to thinking queer. He may otherwise be an honest citizen, but he decides to knock off a stray cow instead of a deer.

"This criminal—and he has suddenly become just that—is hard to catch. The crime often isn't discovered for weeks or months . . . and then the trail is as cold as the frozen meat. But they don't all get away. There are some who are eating prison meat now."

Cattle rustling in the Old West carried with it severe penalties. Many a rustler's neck became closely associated with a rope and cottonwood tree.

Owen P. White, early Western writer, told of Texas cattlemen who were being preyed upon by an organized band that had its headquarters in the little Mexican village of Pilares on the south bank of the Rio Grande.

"The cowmen stood it for a time," related White, "but finding they were not getting sufficient protection from the rangers and river guards, they took the law into their own hands, along with their guns, and invaded Pilares. There was quite a battle. It was staged in a street of the village, and when it was over there were 14 or 15 thoroughly convinced rustlers lying around loose on the doorsteps."

Rustling no longer draws the death

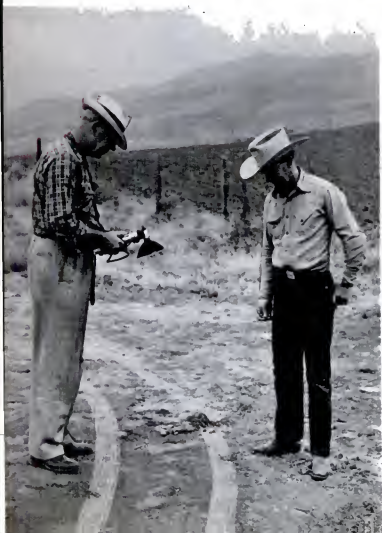
penalty but, with annual losses in the West now mounting into millions of dollars, there are cattlemen who would be in favor of it. Texans the other day started muttering about hanging even being too good for one particular rustler. He stole a calf from behind the Blessed Sacrament Church at Laredo. The calf was to have been given away at a Mexican village.

Still, today's penalties are not exactly mild. Two rustlers in Washington recently got 60 years apiece in the state penitentiary—15 years on each of four counts.

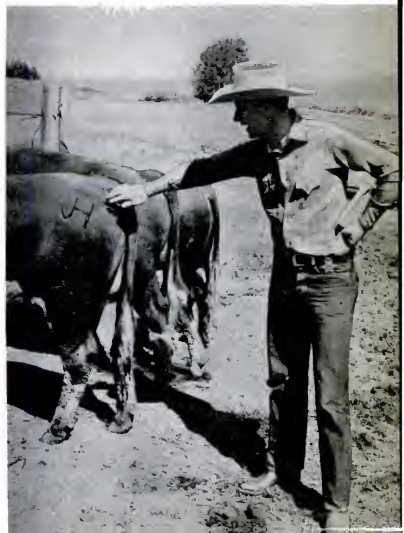
Sheriff Cash, whose domain is cattle and grain-rich Lewis County in central Idaho, typifies the modern law man who is combating the modern rustler. For almost a quarter century, he rode the range and rodeo circuit. In 1925, he was the nation's all-around champion cowboy, and in 1939 at Calgary was crowned "King of the Cowboys" after winning the North American bucking-horse riding championship. He was known as "Cash and Carry" because he carried off so many prizes.

But it's not the prizes that are important to Sheriff Cash now. It's the knowledge of cattle, cattle country, cattlemen—and their parasites. Since becoming a law man, Cash has studied crime

Inspector Walter Lemons and Deputy Jack Maynard photograph the tracks of a motor-mounted rustler



Each year, Idaho officials compare thousands of brands with those registered in state brand book





Sheriff Guy Cash checks for possible hair clues in trunk suspected of having transported rustled calf

After going to F.B.I. in Washington, clues are analyzed and returned to be used as evidence in rustling case

detection at F.B.I. schools, and when he starts on the trail of a rustler he carries with him more than a six-shooter. His working equipment includes a fingerprint-detection outfit, camera and magnifying glass.

In a recent Lewis County rustling case, the sheriff moved in on a suspected truck. It had been washed—but not too well. The magnifying glass picked out blood spots, particles of bone and hair. Then the sheriff went calling at the owner's house, found blood on a boot. The clues were sent to the F.B.I. laboratories in Washington, D. C. Back came the report—all of beef origin. The truck owner was arrested and later was convicted of rustling.

"Shoving back the frontiers has helped—not hindered—the rustler," said Sheriff Cash. "We have many good forest roads leading deep into summer-range country. They make it possible for a rustler to get in and out of the backlands fast.

"You'd think cattle would be pretty safe tucked away in the Selway Forest, but the other day Joe Leach lost 10 head of white-faced beeves. Just vanished—\$3000 worth of meat gone with a rustler. No clue so far to the varmint who did the job, either, although usually cattle taken in quantity are easier to trace than an individual cow."

When only one animal is stolen, the victim often concludes that it has merely strayed. Considerable time elapses before the theft is reported to officers of the law.

Although modern transportation has made rustling easier, in one case at least



horses would have been the more desirable mounts for rustlers. In Utah last winter, two car-borne men pulled up beside a heifer in the pasture of Rodney Beus of Hooper. They put a bullet in the heifer's brain, then dressed it on the spot.

With the meat tucked away in the rear end of the car, the rustlers stepped on the gas, but the wheels only spun . . . and spun. The car was well mired in mud, and the owners with the hot meat were still trying to get the vehicle out when Deputy Sheriff Fent Atkinson came along in his car. He gave them a lift—to jail.

O. J. Shaw, Idaho state brand inspector, warned that with price controls on beef, rustling was bound to increase. More animals would be channeled into the black market. Shaw urged these protective measures:

Reporting of missing cattle quickly. Fast action must be taken if, through immediate butchering and rapid transportation, the stolen animal is not to be lost as evidence.

Keeping an almost daily inventory of cattle.

Checking on suspicious cars or trucks. The night-time "highway rustler" locates



In their constant search for old brands that might trap a rustler, officials clip portion of a steerhide beside a country packing plant

the cattle during the day. He may be well on the way to prison, however, if the rancher has been able to jot down the license number, or at least make and type of the prowling vehicle.

Branding of all cattle for identification. Big operators as a rule brand their cattle. Too many small ones fail to do so.

Idaho has about 40 brand inspectors in the field; the other states more or less in

(Continued to page 242)

Native Montanans learn very young that the branding iron is still the surest way to combat cattle thieves

Montana Highway photo





Sleek U. S. Luxury Liner to Carry 1000 Passengers

Proudly bearing a famous old name, a luxurious new ocean liner is ready for express service between this country and Europe. The S.S. Constitution, a sleek, 29,500-

ton vessel, has a top speed of 26 knots. It carries 1000 passengers in three classes, and was built at a cost of \$25,000,000. The ship will sail a New York-Italy-France route.

Model Catamaran Has Horizontal Sail

In light breezes or a heavy storm, a model boat with a horizontal aluminum sail has proved surprisingly fast and stable. A full-size craft with a sail of the same design is planned. The original model, built by J. R. James of Rustington, England, is a catamaran, with its curved sail pivoted in the center so it can be adjusted to propel the craft along the desired course. One of James' models of this type sailed 100 miles



in crossing the English Channel. Sails of the same shape have also been made of framed fabric and light wood.



Disks Reduce Headlight Glare

Amber disks which slip into place over auto headlights reduce the glare for approaching drivers, yet cause very little loss of total light. The disks, only two inches in diameter, break up the glare from the central filament. Designed to fit any sealed beam headlight, the disks are held in place by the headlight retaining ring. The metal portion of the disk is chrome plated.

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U. S. Air Force photos

Bomb damage to a Korean bridge is vividly reported in a low-level color shot made from a 500-m.p.h. recon plane

OUR EYES ALOFT SPY OUT **the ENEMY**

By Col. George W. Goddard
Chief, USAF Photographic Laboratory

Part I

A MODERN ARMY, navy or air force without efficient photographic reconnaissance could never win a war. They would be like a blind man always advancing into the unknown. This was clearly demonstrated in Korea.

The overwhelming Chinese and North Korean armies, seriously handicapped through the lack of photographic reconnaissance, were restricted solely to visual reconnaissance from hills and mountains. In addition, the enemy had to spend considerable time and effort in camouflaging men, equipment and positions. Late this spring he had to resort to burning smudge pots to hide his operations, and zero weather conditions were always to his advantage.

Today, our Air Force in Korea is equipped

with enough latest-type aerial cameras, flashlight bombs and processing laboratories to supply the United Nations' air, naval, and ground forces with upward of forty thousand 9 by 9 and 9 by 18-inch paper prints per day, depending upon the weather and battle conditions. The demand for more and more aerial color photographs to meet special camouflage-detection requirements started to boom rapidly during the first part of the year.

Most of the black-and-white and color photographs, after they are carefully interpreted and annotated to show enemy positions and our missions of the day, are then distributed to the infantry and artillery. The Air Force in Korea established a great need for stereoscopic aerial color photos

which would enable their photo-interpretation specialists to determine the extent of damage done to factories, oil refineries, rail yards and military installations. These photographs have a great advantage over the black-and-white prints in that they show buildings and equipment gutted or damaged by fire.

In any combat situation the low oblique, stereoscopic color pictures made with twin-lens, continuous-strip cameras enable our intelligence personnel to make positive estimates of bomb damage. Similar color photographs taken of civilian and military installations prior to the actual bombing mission are of inestimable value to the Air Force for briefing purposes. Bombing crews are assembled in a makeshift theater and the stereoscopic pictures are thrown upon a metallic-coated screen in true relief and color. What the crews, using Polaroid glasses, see in these pictures is exactly what they will see on the actual mission. Vital parts of factory installations such as power plants and pumping stations are readily distinguishable from less important buildings.

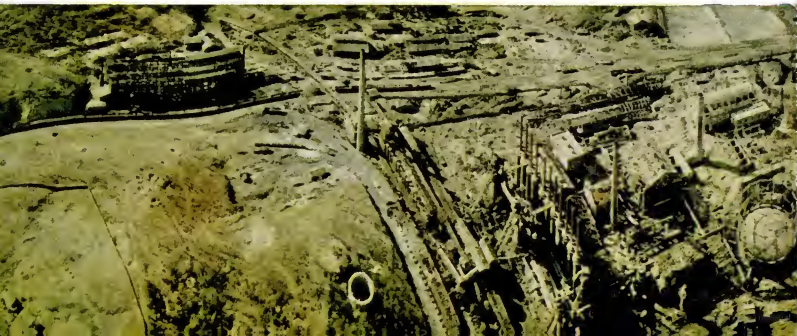
The squadron or group commander conducting the briefing can stop the picture on the screen for lengthy discussion of particular areas without burning the color film, as would be the case if a motion picture film were being projected. The 9-inch film (two 4½-inch tracks) can be compared to a lantern slide 200 feet long moving through the twin-lens projector at any desired speed. In viewing these color pictures, the audience obtains the sensation of drifting over factories in a balloon, instead of the actual speed of 700-mile-per-hour jet aircraft.

Photography's greatest improvement has been in the development of image-motion compensation cameras. Camera fans know that they must hold their ground cameras steady when they make a photograph, and the high speed of the light rays between the lens or focal-plane shutter and the film will stop motion of objects up to $\frac{1}{1000}$ second. In the past, aerial cameras had similar high-



speed shutters, but with the introduction of high-speed jet planes such cameras became obsolete. It was impossible to hold the film stationary and trip the shutter fast enough to stop motion and still obtain a full exposure with maximum definition, particularly in color photography.

This problem was solved by moving the color film over the focal plane, synchronized with movement of ground objects. In one camera, (the continuously moving-film type) the focal-plane shutter with a .004-inch opening is held stationary in the center of the focal plane. But instead of the shutter moving, the film moves over





the shutter at a certain speed. Because of the large ratio between the length of the light rays approaching the camera lens to those passing from the lens to the sensitized film, a large reduction in image-motion speed is effected.

Although ground-image motion may be hundreds of miles per hour, film movement in the camera, perfectly synchronized, may be only a few inches per second. Film and ground, photographically, are traveling at the same speed, and an unbroken image is wiped from the slit onto the surface of the film. Synchronization is accomplished automatically by a device which scans the aver-

Painting up a peaceful application of aerial color photography, here is the center of Denver, with the Colorado Statehouse dominating the right foreground

age pattern of ground motion and reduces it to an electrical frequency by a double-grid and photocell system. The frequency is amplified and matched to a frequency established for the film-moving mechanism, increasing or decreasing film movement as necessary.

Some of the airborne devastation visited upon North Korean heavy industry is shown below. This photo was made at low altitude while the enemy held the area





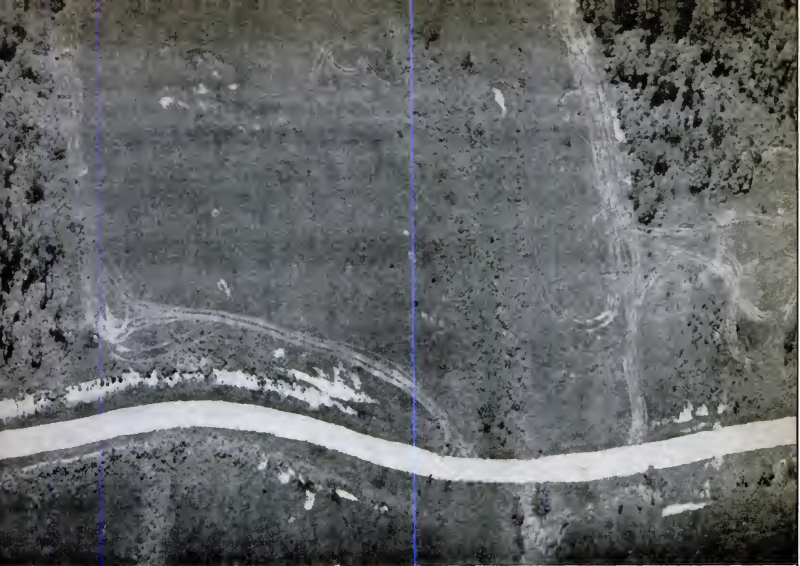
Newly developed camouflage-detection color film reveals tanks hidden at edge of woods. Unnatural foliage and spectral-enamel paints used to camouflage netting, tanks and guns show up in contrast with natural vegetation, which appears red. With this special film, American observers easily spot enemy tanks. Try to find these tanks on opposite page



The strip camera permits the taking of slow exposures bordering on time exposure, even from airplanes speeding along at 600 miles per hour. This is ideal for the long exposures required for color pictures in flight. With a minor change in the gear system of the standard continuous-strip camera, it should be possible to photograph objects on the ground quite clearly at speeds up to 3000 miles per hour above 1000 feet. Higher speeds should be possible when required.

Stereoscopic color films made with the strip camera are of great value to paratroop commanders. They can project third-dimension color pictures on a screen, showing the exact areas where the paratroopers and their food and equipment will

Nose cameras in an F-80 confirmed the claim that bombers had neatly cut this enemy span



Made at same time and place as the facing color picture, the tanks defy detection in this black-and-white print

be dropped. Several showings can be made prior to the actual mission, so that the troops will be very familiar with the type of terrain over which they will operate.

The Air Force has made wide use of a new type of camouflage-detection color film. It has had combat application in the continuous-strip and conventional types of aerial camera in detecting camouflaged military installations and troops. The film has two layers of emulsion; one in infra-red, which records in red all natural vegetation, grass and leaves of trees containing chlorophyll, the chemical about which we know so little. The second layer on the film is panchromatic, which records the unnatural foliage and spectral-enamel paints used to camouflage netting, tanks, soldiers and guns.

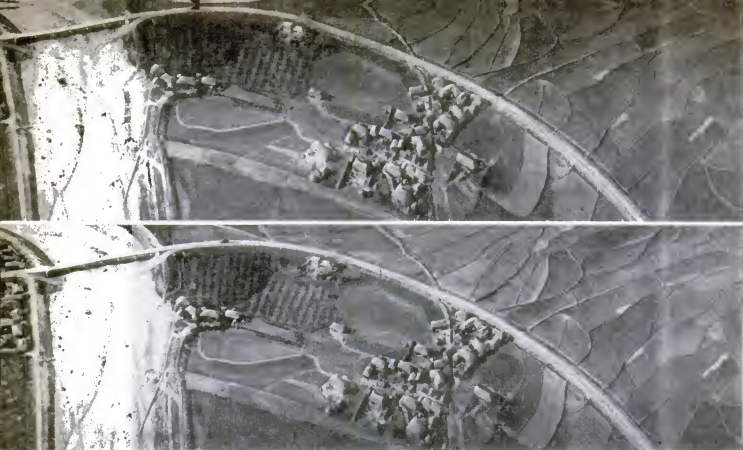
Natural vegetation is seen on the screen in red; unnatural objects in green. These pictures allow the interpreter to see military equipment hidden in woods or under nets, and many things not detectable in the conventional aerial photograph. The branches of trees, after they are cut and used to cover military equipment, gradually change in color from red to green. Troops and tanks moving through fields destroy the grass and leave telltale off-color tracks in the color photographs. Until more is known about chlorophyll, camouflage-

detection film will keep the enemy busy.

United States Air Force research personnel, together with Eastman Kodak Company technicians, have spent hundreds of hours in the air solving the many problems which had to be overcome before a suitable film could be standardized for service use. The most difficult problem was haze, which could not be eliminated by using standard haze filters. The film, known as Aerial Kodacolor, had to be coated with a special emulsion which is less sensitive to the blue end of the spectrum. Each coating of film has to be laboratory tested and a special color-balancing filter provided for each roll of film.

The film was not satisfactory for Air Force use until its speed had been increased to a Weston rating of 24. It could not be used until a simple processing procedure had been devised whereby it was possible for enlisted photographers to develop the film in the heat of the tropics or the cold of the Arctic without elaborate air-conditioned processing machines. Last summer Air Force photographers in Korea and Japan consistently developed 9-inch-wide rolls of aerial color film in tents where the temperature hovered around a humid 100 degrees. Not one roll was spoiled because of the unfavorable processing conditions.

The final development in making color



At briefing sessions, air crew men wearing Polaroid glasses see stereoscopic photos in true relief and color. Closer examination of the one above would reveal curious North Koreans peering up at the reconnaissance plane

film practicable for Air Force use, particularly in high-speed single-seater jet aircraft, was the automatic aperture or shutter control. Color film has very little latitude and must be exposed within at least half a stop of the correct exposure, and these corrections must be made instantly as the plane flies over light areas and the variable dark shadows of the clouds.

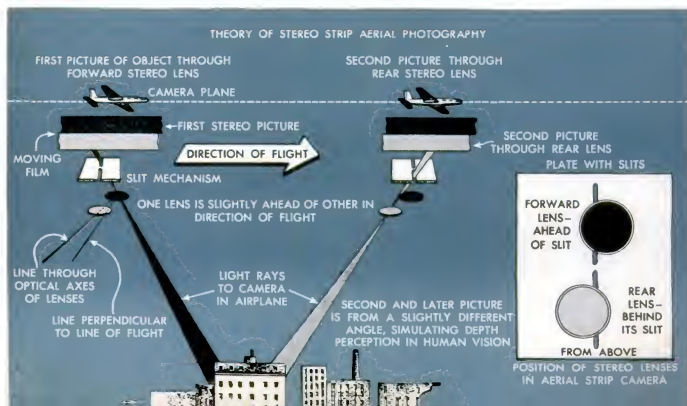
The interpreters, at present, are using reversal color transparencies which afford maximum definition. These transparencies are also ideal for third-dimension projection. Color-printing processes are being developed and will no doubt be used soon.

Aerial color photography has advanced

to a stage where it can play a major role in many peacetime activities. Several well-known commercial aerial-photography companies have adopted the use of this new color film. Topographers will have use for color transparencies in the preparation of colored maps. It will be of great benefit to agriculture experts in studying soil erosion and insect damage, and estimating crops. The U. S. Forestry Department has successfully used it in the location of large stands of certain types of trees.

All other things being equal, color gives a realism that cannot be approximated by ordinary film. It holds the mirror closer to the face of Nature.

Illustrating the principles of stereo strip work, the diagram below shows how the photographs are made





Detroit Listening Post

By Siler Freeman

THE NEW MODELS for which the car-buying public looks at this time of the year are facing uncertainties and delays. Some will be brought out this month and some more next month.

Present indications are that most of the 1952 cars will not be in dealer showrooms until well after the first of the year. And then only in limited quantities.

For many companies, who had planned extensive changes in their present models for 1952, there is a choice of compromising with their plans and going into immediate production of "face lifted" models, or delaying the changeover until needed dies and machine tools can be extracted in between defense orders to bring out the real 1952 model. Most are choosing the compromise of converting slowly.

Dodge, as an example, had planned new body lines plus a V-8 engine along the lines of the now-established Chrysler V-8 Fire-Power. Delay in getting the necessary machine tools will force the division to delay both the new body and the engine. Instead, the early 1952 Dodge will show only a new grille and fender changes.

Ford is another company which is chagrined over many delays. But the new overhead-valve-six engine is in production in their Cleveland plant and will be rushed for 1952 models.

The Ford body will again center about the spinners in the front. The spinner has been the central motif in the postwar Ford and has grown from one to two. Now it will be augmented by another spinner, a large one in the center flanked by two smaller ones. The latter eventually will give way to fog lamps, if the habits of car buyers run true to form.

The new Lincoln is being pushed for early showing. The division is anxious to bring out its new engine to meet the competition from Cadillac and Chrysler.

Cadillac is reworking its engine block and head for 1952 models. With Chrysler pushing its V-8 FirePower to the utmost, Cadillac is looking to its laurels.

General Motors' Le Sabre is reported to be inspiring Chrysler Corp. to design a

rival, powered by a super V-8. It will be a sports roadster with sleek lines and lot of gadgets. It may be some way off, however, because of present conditions.

Of the prospective entries in the passenger-car field, the material shortages are slowing up their plans. Willys, however, is tooling a two-door for production. It is also pushing ahead with a four-door sedan and plans to follow up with convertibles, hardtops and station wagons.

Production scheduling for 1952 will again emphasize the hardtop, while some of the companies will drop a few slow-selling body styles. Dodge has dropped its Sportabout roadster, which never seemed to catch on, and the eight-passenger sedan. Olds has dropped the standard 88, and Chevrolet the fast-back Fleetline, about the last in the General Motors line.

The station-wagon models, however, seem to be safe. Like the hardtop, the steel-bodied station wagons earned remarkable popularity this year and quickly established themselves in the market. Even if the companies are forced to cut down the number of body styles in 1952, the hardtop and station wagon will get big priority on the schedules.

Hovering over all the plans is the Controlled Materials Plan, which takes in the automotive industry this month for the first time. Because of the overordering at the start of CMP, the auto firms are skeptical of how they will fare in the final quarter of 1951. Some fear their steel and copper "hunting licenses" will not bring in sufficient to plan for the rest of the year.

While none of the car manufacturers talks about possible deficits of automobiles this year and in 1952, privately they feel the constant cutting down on quotas and the materials pinch will make new cars scarce commodities. The field stocks, while adequate up to this time, may not be sufficient to take up the slack of reduced production.

And, of course, prices are higher on new models. While this will act as something of a brake on demand, the high national income and the improvements in the 1952 models should overcome buyers' caution.

The true test of an automobile begins when the owner takes the wheel. This is another report from owners of 1951 cars who answered questionnaires sent by Popular Mechanics to 1000 Oldsmobile owners from coast to coast

The OWNERS REPORT

THE POPULAR MECHANICS MOTOR SURVEY
AS CONDUCTED BY FLOYD CLYMER

Model: 88 ☒ Super 88 ☐ 98 ☐ 7/2/51

I am the owner of a 1951 Oldsmobile. Speedometer mileage is now 3500

I have owned it about 3 months. I use premium (high test) gasoline if sluggish and
I use only regular gasoline ☐ - I use premium (high test) gasoline if sluggish and
My approximate gas mileage in the city is 13 MPG; in country, 17 MPG.

I CHANGE OIL ☐ every 2500 miles; I ADD OIL ☒ one quart every 1000 mi.
My car has: Standard transmission ☐ Hydra-Matic Drive ☒ Sluggish and
Very responsive - to much pop on acceleration
Average ☐ Unsatisfactory ☐ on just pavement

How does the car handle on the road? Very responsive - one man's opinion
Maneuverability seems to be: Excellent ☒ Average ☐ Poor ☐
Acceleration is: Outstanding ☒ Very Good ☐ Average ☐ Too low ☐
Curb and road clearance is: Satisfactory ☒ Too high ☐ Too low ☐

Why did you buy an Oldsmobile? Wanted to try V-8 motor and own a heavier car.
What features about the car do you especially like? Am extra pleased with the brakes
and front visibility; accessible controls and readable instruments.
Do you like Oldsmobile's "futuristic" body styling? yes; the new interior finish? yes;
the increased visibility? yes; the return to leaf-type rear springing? no;
If you own a Super 88, what is your opinion of it's body styling, it's size, general design?

How do you like the improved "Rocket" V-8 engine generally? will be fine if going on longer
What do you like about the car? seems a little light in rear, road noise, brake pedal to floor
What do you dislike about the car? to accelerator, headlight dimmer switch in way of left foot.
If so, how many?

Have you ever owned an Oldsmobile before? Yes ☒ Possibly ☐ No ☐
What do you like about the car? Better than I had from
What do you dislike about the car? fewer H. M. C. Motors
more than satisfied.

Would you buy another Oldsmobile? Yes ☒ Average ☐ No ☐
Would you buy another Oldsmobile? Yes ☒ Average ☐ No ☐
Do you secure good dealer service? Yes ☒ Average ☐ Good ☐ Average ☐ Poor ☐
Do you secure good dealer service? Yes ☒ Average ☐ Good ☐ Average ☐ Poor ☐
How would you rate your new Oldsmobile? Excellent ☒ Good ☐ Average ☐ Poor ☐
How would you rate your new Oldsmobile? Excellent ☒ Good ☐ Average ☐ Poor ☐
What type of engine would you prefer in your next new car? In-line ☐ V-type ☒
What type of engine would you prefer in your next new car? In-line ☐ V-type ☒
Cylinders: 6 ☐ 8 ☒ Valves: Side ☐ Overhead ☒
Based on my present experience, I want my next car equipped with: Standard trans. ☐
Overdrive ☐ Oldsmobile Hydra-Matic Drive ☐ Other type of auto. transmission ☒
Please state reasons: After owning a torque converter type I find Hydra-Matic a little more
Do you like the new low-pressure, super-cushion tires? Yes ☒ No ☐ How much more? lbs.
Do you carry the recommended pressure? Yes ☒ No ☐
Please answer all questions (17). Your name will be held in strict confidence.
Please mail promptly to:
FLOYD CLYMER
1268 SO. ALVARADO ST.
LOS ANGELES 6, CALIF.

My Name: [Redacted]
Address: 2 Cleveland, 12 - (Ohio)
City & State: Cincinnati (Mechanical)
Occupation: Engineer
(Use other side for additional remarks.)

Clymer puts Olds 98 through sharp skid in desert area and reports "good control, but some sidesway"



on the '51 OLDSMOBILE

By Floyd Clymer

MOTORISTS IN 20 STATES took time out from cruising in their merry 1951 Oldsmobiles to respond to the *Popular Mechanics* survey of owners. One thousand questionnaires were sent out and 93 percent of those who replied were enthusiastic about the new Rocket V-8 engine. An insurance broker in Newark, N. J., even complained his engine "has too much pickup."

Oldsmobile obviously has a strong hold on many buyers year after year. The survey shows that 95 percent of the '51 owners either will or might buy another Olds.

There were kicks, too. The sharpest ones were directed at the carburetor and body rattles.

Here are some typical responses to the question: Why did you buy an Oldsmobile? "Olds has been my favorite car for years"—Elyria, Ohio, paymaster. "The body is good and it has one of America's three best power plants"—Greenwich, Conn., student. "Most advanced car in America"—Boston, Mass., identification officer. "This is my ninth Olds—I'm satisfied"—South Charleston, W. Va., engineer. "I have bought Oldsmobiles annually since 1941"—Flint, Mich., executive (he did not explain how he worked this during the war years). An accountant of Seattle, Wash., says he bought a '51 "because of the 12 years of good, enjoyable driving in my first Olds."

Apparently the external appearance of the new Oldsmobile is a strong point in its favor. Many owners remarked on the car's beauty, but on the other hand one of the most frequent complaints was "excessive

Olds 98 displays outstanding power as it climbs a steep motorcycle test hill with the greatest of ease



The owner of an Oldsmobile Super 88, chef James Jones of Flagstaff, Ariz., says he averages 18 miles on a gallon of gas, but that his "88 goes too fast!"



Percentages from P. M. Poll

Owners of Model 98	37%
Owners of Model Super 88	34%
Owners of Model 88	29%
Average gasoline mileage in country	17.1 m.p.g.
Average gasoline mileage in city	13.9 m.p.g.
Use premium gas	95%
Use regular gas	5%
Owners who change oil	97%
Average mileage for change of oil	1870
Owners who add oil (and also change periodically)	22%
Average mileage for adding oil	1358
Maneuverability excellent	78%
average	21%
unsatisfactory	1%
Acceleration outstanding	63%
very good	30%
average	6%
poor	1%
Road clearance satisfactory	95%
too high	3%
too low	2%

Best-Liked Features

Rocket V-8 engine	93%
"Futuristic" styling	94%
Visibility	98%
Interior finish	94%
Leaf springs	89%

(These percentages were tabulated from answers to specific questions in the poll.)

Owners' Rating of Car

Excellent	59%
Good	32%
Average	7%
Poor	2%

General Information

Prefer V-type engine	95%
Prefer in-line engine	5%
Prefer eight cylinders	97%
Prefer six cylinders	3%
Prefer overhead-valve system	82%
Prefer side-valve arrangement	18%
Prefer automatic transmission	96%
Prefer standard transmission with overdrive	1%
Prefer standard transmission	3%
Prefer Hydra-Matic Drive	95%*

(*The above figure means 95% of the 96% preferring automatic transmissions.)

Prefer other makes than Hydra-Matic	5%
Owners who like low-pressure tires	76%
Average pounds carried above recommended pressure	3.9

(By 58% of owners reporting)

Previous Oldsmobile owners	65%
Will buy another Oldsmobile	68%
Might buy another Oldsmobile	27%
Will not buy another Oldsmobile	5%
Dealer service good	61%
average	25%
poor	14%

Most frequent objections:

1. Engine noise and carburetor; 2. body assembly, rattles, paint chipping

chrome trim." Several remarked on this, especially on the front of the car, but a children's-wear buyer in Milwaukee, Wis., said, "I like the chrome strip that extends the full length of the 98 model, since it protects the paint from being chipped by those 'don't give a hoot' door openers in parking lots." He also did not like the grille being so far forward, "since parkers can easily dent the bars."

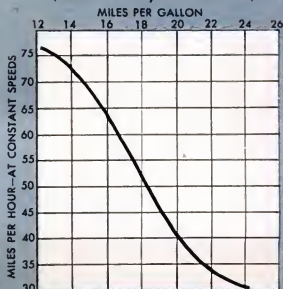
The Oldsmobile Hydra-Matic Drive was approved by 95 percent of the owners. "Ease of handling" and "I can have both hands on the wheel" were frequent reasons why. A Clinton, Iowa, clergyman said: "The complaints one generally hears about Hydra-Matic are groundless, in my opinion. This is my fourth Hydra-Matic Olds. It has excellent pickup, very little jerk, good gas mileage, no driving worries!"

A South Boston, Mass., radio-station owner said: "Hydra-Matic is O.K. and has been proved. I prefer the Hydra-Matic over the Dynaflo or Powerglide, but if Olds could include a typical over-drive for cruising it would be more economical to drive."

A Los Angeles doctor says:

ECONOMY TEST

(Olds 98 with Hydra-Matic Drive)



At constant 30 m.p.h. 24.11 m.p.g.
 At constant 50 m.p.h. 18.30 m.p.g.
 At constant 60 m.p.h. 16.70 m.p.g.
 At constant 75 m.p.h. 13.10 m.p.g.
 MILEAGE — Denver to Cheyenne, Wyo., and return



Economy test of Hydra-Matic-equipped Olds included travel over icy road from Denver to Lookout Mountain

"Finest car I ever owned, good gas mileage, wonderful acceleration and top speed. Only objections are no parking position on shift lever, and Hydra-Matic shift seemingly should be smoother."

Here are some more comments favorable to Hydra-Matic: "No trouble with four I've owned"—Charlotte, N. C., business manager. "Experience shows Hydra-Matic is trouble-free and gives good performance"—Michigan executive. "Easy for my

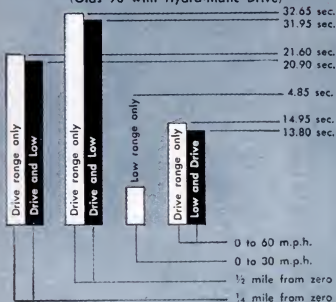
wife to drive"—Long Beach, Calif., crude-rubber inspector. "No racing of motor . . . faster acceleration"—Waterloo, Iowa, meat salesman.

Since the survey asks owners to mention what they dislike about the car, a wide variety of answers is expected. Here are some samples: "Steering ratio, center of gravity too high, too much chrome"—Huntington,

Mechanic finds Olds wheels still in alignment after car is tested on desert and severe mountain roads

ACCELERATION TEST

(Olds 98 with Hydra-Matic Drive)



1/4 mile from zero	Drive range only	21.60 sec.
	Drive and low	20.90 sec.
1/2 mile from zero	Drive range only	32.65 sec.
	Drive and low	31.95 sec.
0 to 30 m.p.h.	Low range only	4.85 sec.
0 to 60 m.p.h.	Drive range only	14.95 sec.
	Low and drive	13.80 sec.





Oldsmobile owners reporting in the survey gave high praise to Rocket engine packed with power and speed

W. Va., physician. "Too jumpy when changing gears. Too much road noise"—Charlotte, N. C., electrical contractor. "Give us a longer wheelbase on the 98 model. It rides choppy"—Lincoln, Neb., salesman. "The paint job isn't too good—the standard 88 is a little light for the volume of power"—Charleston, W. Va., bus driver. "Horn too small, poor-sized motor, ash tray in awkward spot"—North Caldwell, N. J., housewife. "If you open the trunk in the rain, all the water runs into the trunk"—Roslindale, Mass., postal clerk. "Body is a dust catcher (not satisfactory on a dirt road). The oil filter is in a bad place to change"—Reardon, Wash., teacher. "Takes too much break-in to make a smooth-running car;

they still don't use a good carburetor. Requires too much tinkering to make a smooth engine performance." — Mission, Kans., business man.

"How does the car handle on the road?" was one of the questions asked, and replies to it were almost unanimously favorable. "Excellent," "wonderful" and "very fine" were frequent replies. "Couldn't ask for anything better for its weight," wrote an Iowa man. Several owners referred to the quality of "pep" on the road, as did a Detroit salesman who thinks there is "nothing like it on the road." A few owners expressed the opinion that the 1951 Olds 88 is not quite as good as the previous model. A Wenatchee, Wash., building contractor said the

Rocket engine has "more power and quicker take-off," but "comfort doesn't seem to be in the '51s." A switchboard repairman in Cedar Lake, Ind., who has owned 15 Oldsmobiles, said he especially likes "the heavy chassis and road clinging on curves, good hill climbing."

Only five percent of the owners replying use standard gasoline, and the survey's over-all mileage figures were 17.1 miles per gallon in country driving, and 13.9 miles per gallon in the city. A Milwaukee, Wis., maintenance mechanic said: "Of all the cars I have owned,

(Continued to page 252)



Curved, one-piece windshield and solid "feel" of the steering wheel add to driver's comfort in handling the '51 Oldsmobile



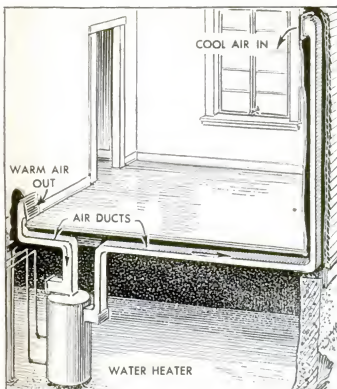
Mrs. Carr dresses a "Whimsy" with clothes designed especially to suit buyers. Above right, heads are shaped with modeling clay

"Whimsies"—Factory-Made

WHEN Henry Carr opened a paint store in Lakeport, Calif., he realized the best customers are those who enter a store in a happy mood. A former advertising cartoonist, Carr used his talents to carve a "Whimsy" to attract customers to his store. The little figure created so many comments that he decided to set up a factory and sell them for advertising and display purposes. Carr's factory, now equipped to turn out 25 Whimsies per day, includes production men who continually work on new faces to change the characters. The midgets are four feet eight inches tall and have cast rubber heads fitted to jointed bodies cut from palm wood. They are bolted together and can be adjusted to various positions.

Right, customer admires an Indian Whimsy outside John Carr's paint store in Lakeport, Calif. Below, realistic characters are not a group of college playboys, but Carr's own brain children





Connected to ducts, the electric water heater will keep one or two rooms comfortably cool in the summer

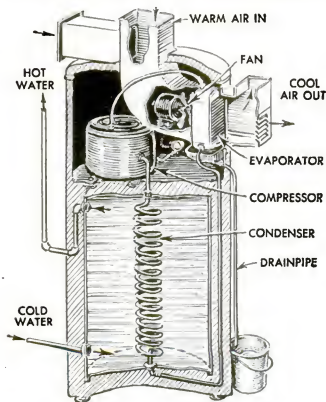


Right, a 53-gallon heat-pump water heater is shown beside a standard electric resistance heater, left

Electric Heater Provides Hot Water and Cool Air

HEATING WATER and cooling air may sound like two unrelated operations, but an electric water heater, using the heat-pump principle, does both at the same time. And, amazingly enough, it does them cheaper than a resistance heater can provide hot water alone. As if this isn't enough for one appliance, it also dehumidifies your basement at no added cost!

There's nothing secret about the device—



it's an adaptation of the heat pump. Today's best known and most reliable heat pump is the electric refrigerator—a most dependable piece of machinery. The new water heater uses the same basic parts, but they are larger and more expensive. It is expected to cost almost twice as much as a conventional electric water heater, but its operating cost is about one third less and you get an air conditioner or dehumidifier for the one price.

A small amount of heat is removed from the air and compounded many times by mechanical compression. This heat is then released into the water, warming it to the desired temperature. In the summer, of course, the heat removed from the air is free. In the winter, the usual losses from the house-heating plant provide the heat with no noticeable increase in the fuel bill.

Basement dehumidification is provided by the evaporator coil. Warm air passing over the cool coils releases much of its moisture, eliminating musty odors and making laundry dry quickly.

The heater is not yet available, but about 50 of them have been field tested for more than a year and were found to be practical. Several changes are being made to eliminate minor defects and before long you should be able to get one of these multi-purpose heaters for your home.

When heater is cooling rooms, air enters from top center; when dehumidifying basement, from top left



Telephoto lens, above, is mounted in a gun turret, above left, to provide required precise aim. Left, high-altitude photo of mine parachute taken by lens



Navy's Supertelephoto Lens "Shoots" Invisible Objects

With a new 40-inch telephoto-lens assembly, a photographer could take pictures of a ball game at Griffith Stadium from the top of the Washington Monument, two and a half miles away! So much does this long-lens assembly magnify that it will photograph objects not visible to the unaided eye. The Navy developed the lens for studying operation of mine parachutes at high altitudes. A 16-mm. movie camera is used with the lens.

Ice-Free Jet Planes

Electric "blankets" prevent ice from choking off air intakes (see arrow) of jets. Without air there is no combustion and the engine won't run. At the flip of a switch tiny resistance wires embedded in rubber padding around the openings heat up like a toaster. The electricity comes from the airplane's regular power supply. Antenna masts, propellers, wings, control surfaces and other vital parts can also be fitted with the electric rubber.





Chicago Doctor Develops Electric Dissecting Needle

To further heart experiments, an electrically driven dissecting needle has been made that is delicate enough for operations on the nervous system of a chick embryo. The extremely sharp point of the needle sets up highly localized stress concentrations on the particular tissues to be cut. It will be used to separate the hind brain of a chick embryo and prevent the development of nerve cells in the heart wall, allowing scientists to determine whether certain drugs affect the nervous system or muscle tissues of that organ. It was conceived by Dr. David S. Jones, a professor at Loyola University in Chicago.

Chemical Kills Mighty Mite

Mites, the powerful little insects that attack plants, animals and human beings, are killed by a new chemical powder. The best-known mite is the chigger, which attacks man. Others are troublesome to chickens, shade trees, fruit trees and many plants. The mite population has grown rapidly since the development of modern insecticides, probably because the sprays kill insects which feed on mites but not the mites themselves. The new mite killer, developed by the Naugatuck Chemical Division of the U.S. Rubber Company, is non-toxic and has been tested with excellent results on trees, plants and animals. It is marketed as a powder which is mixed with water to form a spray solution.

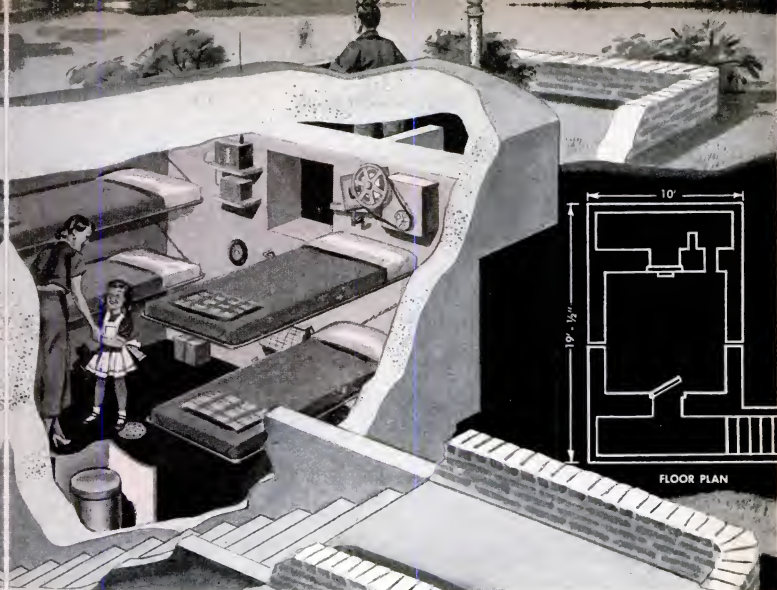


BACK-YARD

FOR THE PRICE of a new car you can build a super bomb shelter designed to withstand an atomic blast at "ground zero." The domed roof of the structure has twice the strength needed to withstand the calculated shock from an air burst and it affords the same protection against radiation as do 5½ inches of lead.

Projecting slightly above ground level, domed roof of the shelter has a maximum thickness of 36 inches





BOMB SHELTER

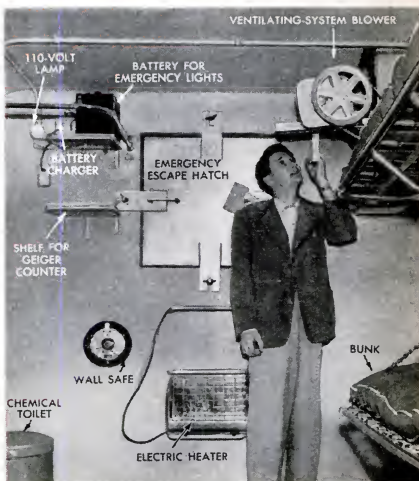
Cutaway drawing and floor plan indicate interior arrangement and the size of the underground structure

Engineered by Eugene Greenwood and Charles Cartledge of Santa Ana, Calif., after thorough studies of the effects of atomic weapons, the main portion of the shelter consists of a boxlike central room. It has a protected entrance stairway at one end and an emergency escape hatch at the other. All construction is of reinforced concrete. Walls are from 12 to 18 inches thick, and the roof has a maximum thickness of 36 inches.

The shelter uses ordinary 110-volt current for normal operation of interior lighting, radio and forced-air ventilation. It likewise has a stand-by battery for radio and lights and a hand crank for operation of the ventilating system.

Several of the shelters are under construction in southern California at prices ranging from \$2500 to \$6000, depending on size.

If power fails, the ventilating system can be operated by a hand crank. Storage battery is provided for lights and the radio



*Raystone Picture, N.Y.
217 E. 44th St. N.Y.C. 17-17*

Picture in Auto Art Book, p. 160



So roomy it bulges, the French car looks like a sight-seeing bus. There's no question about visibility here



Doors open in the middle. The upper portion slides into the roof; the lower portion down into the floor

FRENCH ELECTRIC CAR

Using a power system similar to a diesel-electric locomotive, a unique French automobile is driven by four small electric motors—one for each wheel. Current for the motors is generated by a six-horsepower gasoline engine. This power plant is about the size of a large motorcycle engine, yet it generates enough power to move the car and its six passengers at speeds up to 60 miles an hour. The electric drive simplifies design. No gearbox or transmission is required. Braking is electric, eliminating drums and linings. Little space is needed for the engine and more is available for passengers. The body, suggestive of a wheeled goldfish bowl, has doors that slide up into the roof and down into the floor. The car has been named the Symetric.

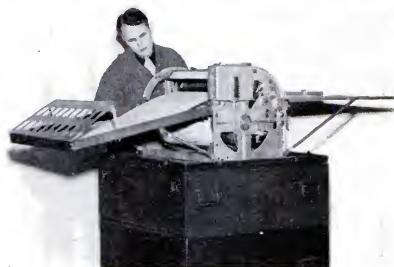
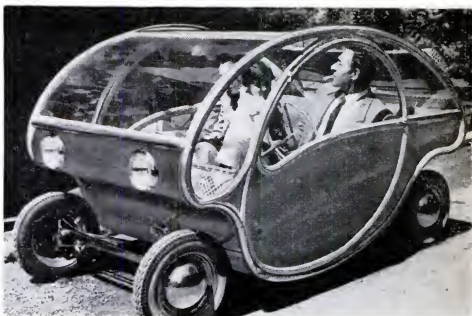
Behind this hub cap is one of four electric motors that are built right into the wheels

From the outside, the car may look strange even by foreign standards, but it is as roomy and luxurious as a limousine



Artist Designs Transparent Auto

There's all-around vision for every rider in a revolutionary new automobile designed by French artist Paul Arzens. A transparent plastic hood covers the entire car, and windows of the same material cover the two sides. Other features of the little car include oval doors and completely exposed wheels. The auto weighs only 225 pounds.



Army Engineers Devise Four-Color Duplicator

Maps, charts and overlays can be reproduced rapidly in four colors with a new duplicator developed by Army engineers. The machine is called a spirit duplicator because it uses fluid alcohol instead of water as a transfer medium. The material to be reproduced is typed or drawn on a covering sheet backed up by a colored carbon sheet similar to a typewriter carbon. The covering sheet then is removed and the carbon, which has received the image in negative

form, is placed on a revolving drum. Alcohol-moistened paper, fed under the drum, picks up the image in positive. Four colors of carbons can be used, and register is accurate within $\frac{1}{32}$ inch.

COMING—In January 1952

Your Anniversary Package

YOU CAN begin to look forward to the most exciting issue in *Popular Mechanics'* history!

Next January, in celebration of 50 years of publication, we will bring you a big magazine—more than 450 pages!—full of the pictures and feature articles you look for every month: the newest in mechanics and crafts, science, hobbies, things to do and things to learn.

All this, your regular diet, plus a big bonus in anniversary features:

Special articles by some of America's greatest living men.

Nostalgic bits from P.M.'s early days—reminiscent stories and old advertisements of the first vacuum cleaner and the "antique" automobiles that were just beginning to splash mud when *Popular Mechanics* was born.

You'll want to keep the album of old cars, in full color. You'll read, and reread, and keep the Golden Anniversary issue as a memento for years to come.

If you're not already a subscriber, be sure to get the January issue, by subscribing now! Or place your order now with your news dealer. It will disappear from the newsstands in a hurry.

Which Way Does Lightning Travel?

Did you see a bolt of lightning come out of the sky to strike the earth with a terrific flash during that last thunderstorm? You didn't, say experts at General Electric's high-voltage laboratory, because lightning bolts travel from the earth to the sky and not from the sky down to earth! As a lightning charge builds up in the clouds, an opposite charge is building up in the earth. The stroke travels slowly from the clouds to earth, invisible to the naked eye. When it hits the ground, a visible flash, which we call lightning, spurts from the earth, traveling upward at about 18,000 miles a second.

Switzerland is reported to be using some of its lakes as cold-storage chambers, lowering food in sealed drums 40 feet below surface level.

HOUSE OF STEEL



Tool held by workman at right draws the panels together for welding

IN TWO DAYS, a "house within a house" was erected not long ago on a concrete slab in Los Angeles. It consists of prefabricated panels, made up of two sheets of 18-gauge hot-rolled annealed sheet steel separated by two inches of rock-wool insulation. One side of the panel, the exterior wall, is treated with a prime coat and sprayed with a special paint to either a smooth or stucco finish. The interior wall may have a washable paint, wallpaper or other finishes. The panels are joined together by a slotted device and spot welded. At important points electrical spot welding is used near to, but not on, the exposed surface, eliminating a general tendency to underheat welds in order to preserve surface appearance. The house is simple

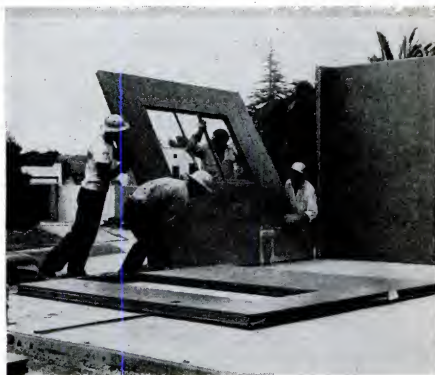
enough to be put up by ordinary construction labor and one skilled workman. Because of the slotted device, it can be disassembled with a crowbar, after the roof is removed. The first steel house was demonstrated at the Chicago World's Fair of 1933, and several more were later built in the East and in St. Paul, Minn. Research on these houses, under a wide range of temperature conditions, provided information that further solved the problems of insulation, conductivity and condensation. One of the last houses to be erected before war production made steel unavailable was put up in the San Fernando Valley, near Los Angeles, in 1941. With no maintenance expense since then, it is in excellent condition, free from rust or corrosion.

Completed house, two sheets of steel thick, looks like a conventional home. It is both rust and crack-proof



Panels being placed on concrete-slab foundation in the proper sequence for erection. They will next be fitted in metal channels at edges of foundation

Raising the steel wall panels, middle right. Because of its simplicity, the house can be put up by construction labor, helped by one skilled workman



Ventilation and heating ducts, above, are built in the wall. House interior can be painted, wallpapered or covered like any ordinary wall surface

Welding roof center cantilever beam, right, into place. Workmen using crow-bars can disassemble a house in two days, after the roof has been removed

PLANT MODELS HELP CANADA FIGHT PESTS



As treatment of spruce boughs to retain needles removes natural color, they must be painted individually

By Lyn Harrington

Photos by Richard Harrington

FOR THE PAST 25 years, Albert A. Wood of Chatham, Ont., Can., has been creating wax models of farm and forest plants showing insect, fungus and mechanical injury. In the Entomological Laboratory of the Dominion Department of Agri-

culture, he translates the findings of the research staff into visual—and alarming—evidence of the insect menace. The exhibits which he prepares go to inspection offices across the country.

This modeling is one of the half dozen

Tobacco leaf, left, was cast by "celluloid" process. Sugar-beet roots at right were reproduced in wax





Full-scale radishes show maggot injury to plants. The tiny rootlets are cotton thread attached with wax

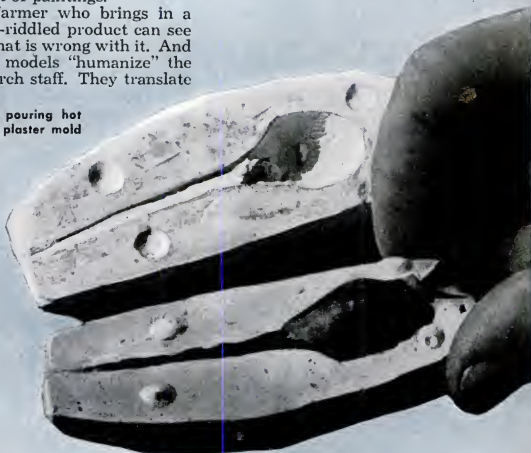
special projects of the Chatham laboratory, though Wood's work is national in scope. First, the models are invaluable to inspection officers throughout the provinces. It is much easier to familiarize one's self with pests and diseases from a life-size model than from the best of paintings.

Secondly, the farmer who brings in a diseased or insect-riddled product can see for himself just what is wrong with it. And not least, Wood's models "humanize" the work of the research staff. They translate

highly technical lore into something which the man in the field can understand. If the farmer, the forester and the general public can be made insect-conscious, such depredations will not go unchecked.

Wood's subjects are garnered from varied

Radishes are cast by pouring hot wax into a two-piece plaster mold





To produce most leaf models, Albert A. Wood paints several shades of cellulose solvent on small leaf mold

sources—usually entomological and pathological labs. In creating models, he uses fine dental plaster to make a mold in two or more sections directly from the fruit or vegetable. He immerses the hardened plaster impression in hot water, then pours in purified beeswax. The mold is held together under pressure until the wax sets.

A flexible rubber mold is necessary for awkward shapes such as forked carrot or mouse-eaten sugar beet, and liquid latex is used for this type of mold. The latex has another valuable characteristic. Soaked in kerosene overnight, it enlarges 50 percent

—perfect in every proportion. Thus by a series of molds, Wood can develop the model to any size desired.

When creating a series of similar objects, say yellow peaches or green tomatoes, he adds oil paint to color the melted wax. But white wax is generally used, since some of the models must show the white flesh of potato or apple, and also the white wax is more likely to give truer coloring.

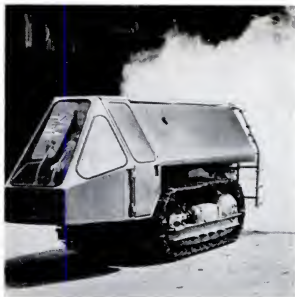
With the original subject before him, Wood airbrushes on the base color and adds the fine details by hand. The wax

(Continued to page 248)

Soft, pulpy tobacco worm is shown here in wax along with tobacco leaf that has been damaged by the pest



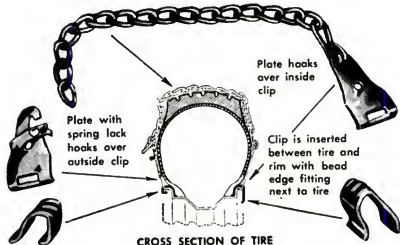
Which one is real? Two apples of different varieties attacked by scab—one at left is wax casting



Donkeys and Tractors Join War on Insects

Animals and machines that combine forces in an all-out war on bugs and weeds were demonstrated to delegates at the International Agricultural Conference in England. Various types of spray equipment, ranging from helicopters to hand

sprays, were demonstrated. One, a light-weight, gasoline-powered spray unit, is designed to be mounted on a donkey's back and carried through the fields. Another is an enclosed spray unit mounted on a narrow-gauge tractor chassis.



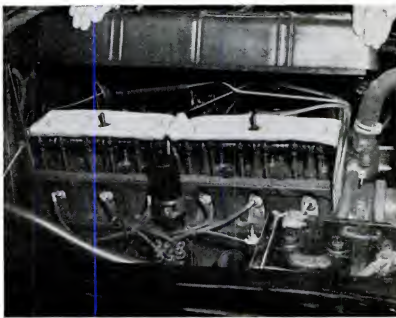
Clip-On Tire Chains

In emergencies on snow, ice, mud or sand, the motorist can snap on this set of chains in a few seconds. Pairs of permanent clips fit between the tire and rim and need not be removed. They are inserted on opposite sides of the wheel to maintain balance. Chains are attached by simply hooking them over the clips and closing the spring locks, which are a part of the outside cross-link plates, to assure a tight grip.

"Blanket" Quiets Rocker Arms in Overhead-Valve Engines

Quickly slipped over the rocker arms of an overhead-valve engine, a silencing pad cuts tappet noises and, at the same time, provides better lubrication. The "blanket" becomes soaked with oil and acts as an immediate source of lubrication when the engine is started. It also prevents damage from condensation that drips from the valve cover. The pads are made to fit Chevrolets, Buicks and G.M.C. vehicles.

☐ Fingerprints of men who sealed jars containing oil, probably about 3500 years ago at Mycenae, Greece, were still clear when the jars were unearthed last year.





University of Illinois Medical School photos

With the new Ivy-Gordon-Fainer method of artificial respiration, the victim's hips are raised (1) about four inches 12 times a minute, alternating (2, 3) with pressure applied against the lower part of the back

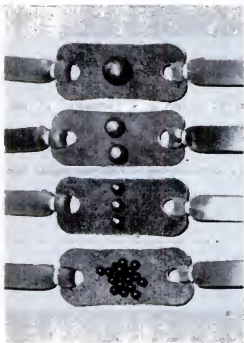
"Push Pull" Called Best Method For Artificial Respiration

Lifting or rolling the victim's hips, when used alternately with the familiar Schafer prone pressure method, doubles the effectiveness of artificial respiration. About twice as much air gets into the lungs. This was reported to the American Medical Association in a study made by Doctors Andrew C. Ivy, Archer S. Gordon and David C. Fainer of the University of Illinois. With the patient prone, his hips are lifted four inches 12 times a minute, alternating with pressure applied against the lower part of the back. Hip rolling, a less tiring substitute for lifting, is accomplished by grabbing the victim's distant hip and rolling it against the rescuer's knee and back again.

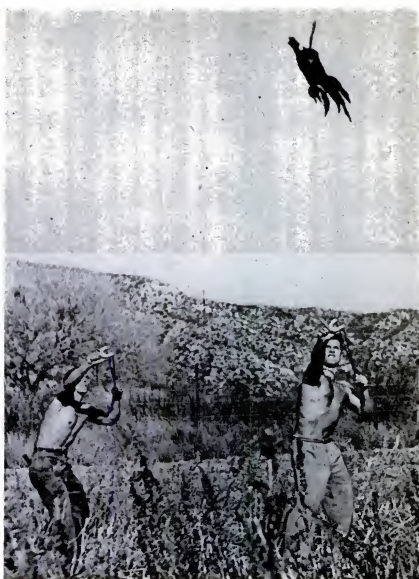
Slingshooting Huntsmen

ONCE STRICTLY a boy's weapon, the slingshot is now being taken up by people of all ages. One major manufacturer reports 85 percent of the buyers are adults. It is widely used against crows and other animals in the nuisance class, for herding cattle, for keeping strange dogs off the lawn and for hunting in areas where firearms are forbidden. At 30 feet a half-inch steel ball from a slingshot will kill a rabbit. The same missile can be driven entirely through a $\frac{3}{8}$ -inch plywood target at the same distance. Against quail and other small birds, a slingshooter using up to a dozen BB pellets produces a scatter charge like that from a shotgun, increasing his chance of hitting the bird in flight. A scatter charge makes a 12-inch pattern at 30 feet. Serious slingshooters won't use a weapon that is cut from a forked limb because it is too inaccurate. They buy a commercially made slingshot for about a dollar, or cut one from $\frac{3}{4}$ -inch hardwood. The pouch is of soft cowhide $1\frac{1}{4}$ inches wide and 3 inches long. The rubber straps are of $\frac{1}{16}$ -inch pure gum rubber compounded to prevent cracking, $\frac{1}{2}$ inch wide and about 9 inches long, shorter for short-armed people. Rubber from an inner tube is too dead for powerful shooting. To use a slingshot, grasp the handle firmly with three fingers and brace the forefinger and thumb against the forks. This increases accuracy and reduces the strain on your wrists. Slope the slingshot 45 degrees off the vertical and sight over the higher fork. The pellet is centered in the pouch and the rubbers are drawn back evenly alongside your cheek or ear. Never hold the pouch in front of your face because a broken rubber might fly back and hit your eye.

Small rocks and pebbles aren't recommended as ammunition because they rarely fly accurately. Quarter-inch steel balls may be used singly or in twos and threes against small game. Worn or rejected ball bearings are ideal pellets and often can be bought cheaply at machine shops. For practicing it is a good idea to pin a target to a blanket that is hung from a line. This makes a dead backstop and the pellets drop to the ground where they can be picked up for reuse. Accuracy comes quickly with practice, once you have learned the "feel" of the slingshot and how to hold it. As an indication of the weapon's adult popularity, there is now a National Slingshot Association, with headquarters in San Marino, Calif., and member clubs in every state in the union. One Kentucky club will not accept members under 50 years of age.



Half-inch steel balls pierced $\frac{3}{8}$ inch of plywood, top, from 30 feet. Various loads range up from scatter charges of BB shot to heavyweight ball bearings



Hunting with slingshots, two sportsmen get in their second shots at a duck one of them has hit. The BB scatter loads are generally used on quail and other small birds. They fashion a pattern comparable to that of a shotgun, increasing the probability of hitting the target

Quarter-inch steel balls are used on most practice ranges, where the shooting is done at the standard targets used for small-caliber rifles. The sling is held at a 45-degree angle, with the thumb and forefinger held high





SWEPT-WING transsonic planes that use the ocean as a runway will be the next big development in military aviation. In fact, a whole new family of transsonic and supersonic flying boats is being designed, ranging from small interceptors to medium bombers.

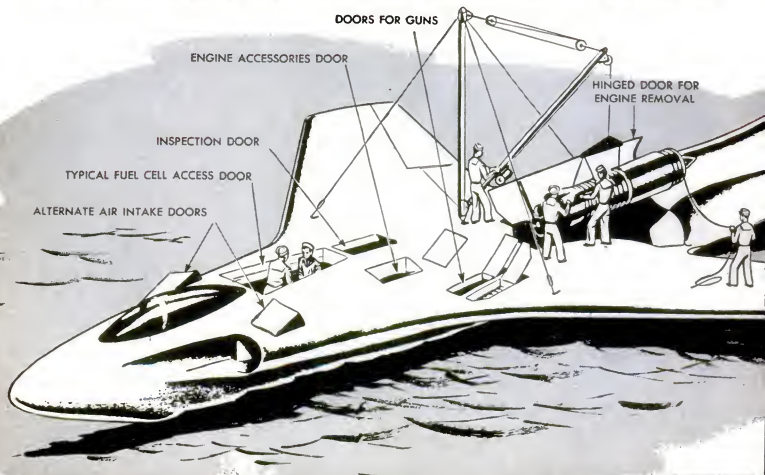
Those are conclusions based on the just-released report of the secret "Skate Project," in which the Navy gambled almost a million dollars on the belief that Ernest G. Stout of Consolidated-Vultee Aircraft Corporation could drastically improve the air speed and seaworthiness of flying boats. Stout, head of the Convair hydrodynamics-design staff, came through with a brand-new concept of what flying boats should be like.

The Navy wants high-speed, water-based aircraft because its airplanes are getting so large that carriers can accommodate only limited numbers of them. And the Air Force is looking over the Navy's shoulder because it would

Stout shows how the hull of his radio-controlled model blends into the contour of the wing. Hull design permits shorter take-off than land-based plane

JET-PROPELLED FLYING BOAT

Drawing of a full-size water-based plane shows how it could be made easily accessible for engine maintenance





As scale model is towed at high speed through the water, "dams" in hull minimize spray against the tail

like to avoid the delay of building long concrete strips for its fast fighters close to the front lines. Suitable rivers, lakes and coastal waters are found almost anywhere.

Instead of resembling the winged boats of the past, the new designs of water-based aircraft have clean, aerodynamic shapes of high Mach number, with a fuselage or hull modified to give good hydrodynamic performance. Stout achieved this result by blending the hull with the wing so that it became a fat V-shaped center section of the wing, and by providing retractable longitudinal "spray dams" that prevent the

hull and wing from being smothered by foam and spray during the water runs.

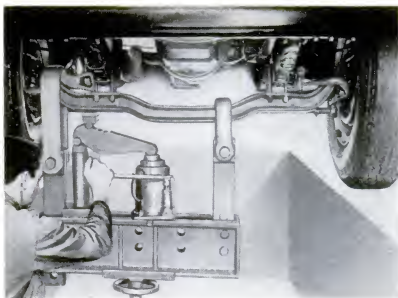
He proved his theories with radio-controlled, jet-propelled scale models that take off from the water, maneuver at high speed and land again just like full-sized aircraft. This same technique with self-propelled models saved years of research in developing Convair's present XP5Y-1, a turboprop flying boat of conventional lines that probably will be the last of its type because of the new designs.

The Skate Project, so named because

(Continued to page 268)

Model, powered by two jet engines and controlled by radio, behaves exactly like a full-size plane for airworthiness tests



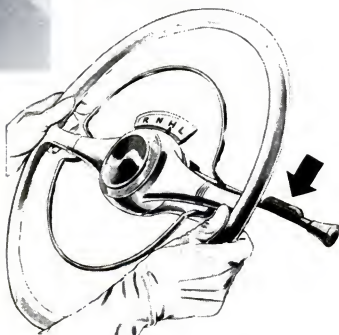


Hydraulic Axle Straightener

Bent axles on heavy trucks and busses are brought back into alignment with a hydraulic tool that develops pressures up to 210 tons. No dismantling of the vehicle is necessary, the straightening being done cold and with the axle in place. Accurate alignment is assured by gauges that show when the required corrections have been made on the bent axle.

Push Button on Gearshift Controls Brakes on Hills

Attached to the car's braking system, a push-button-controlled cylinder allows the driver to hold the brakes on without touching the brake pedal. Once you have stopped the car with the brakes in a normal manner, you press the gearshift button and the brakes remain locked even though you remove your foot from the brake pedal. When you depress the accelerator pedal, the brakes are automatically released. The system ends stop-light "creep" and dangerous rollbacks at hillside stop lights.



Combination Car Bed and Seat Keeps Baby Safe and Comfortable

Baby rides in comfort in a convertible automobile bed that can be used in either the front or back seat. It also converts into a car seat when desired. The mattress, which has both head and side "bumpers" for comfort as well as safety, is built in, and the unit folds flat for storing.

Antibacterial Concrete

Concrete that checks the growth of bacteria and fungi has been developed for floors and walls of dairies, gymnasiums, showers and kitchens at the New York State College of Ceramics. After nine years of use, the antibacterial concrete still remains highly efficient. Tests have shown that the concrete holds from 54 to 96 percent fewer bacteria than ordinary concrete. It is made by adding pentachlorophenol, a fungicide used to preserve railroad ties and telephone poles.

⌚ The first aluminum smelting plant to use lignite (subbituminous coal) for fuel will be built by Aluminum Company of America near Waco, Tex.



Dan Sanborn photos



Plastic Water Skis

Now the famous mermaids of Florida are skimming across the water on skis made of transparent plastic. Each ski is tapered like a snow ski from a center section $\frac{3}{4}$ inch thick to ends only $\frac{1}{4}$ inch thick. The ski

is built up of $\frac{1}{8}$ -inch sheet plastic, stiffened around the edges with wood strips. An aluminum fin at the back end helps the wearer control the ski. A rubber shoe holds the foot firmly, yet permits the wearer to kick the ski free in case of a spill. Plastic skis are slightly heavier than wooden ones.



Glowing Panels of Glass or Plastic Provide Light

No bulbs, tubes or filaments are required in a new lighting system which employs a panel of glowing glass. The thin sheet of glass—or plastic—conducts electricity. The sheet is coated with a "phosphor dielectric"—a material excited to luminescence in an electrical field—and a thin layer of metal foil. Wires are connected to the edge of the sheet and plugged directly into ordinary house current. The entire panel then glows with a subdued light. Various colors are possible by depositing different mate-

rials on the glass. The intensity of the light can be greatly increased by boosting the voltage with an inexpensive transformer. In addition to lighting large areas with a soft light, the system can be used to illuminate clock faces, wall switches, stair treads and house numbers. The system is so economical that, for example, a clock face can be illuminated for a year at a cost of only two or three cents. Inventors of the new light source report that it will have an expected life of one to five years.



Wearing a tank's helmet, the author gets ready for a spin around the test track

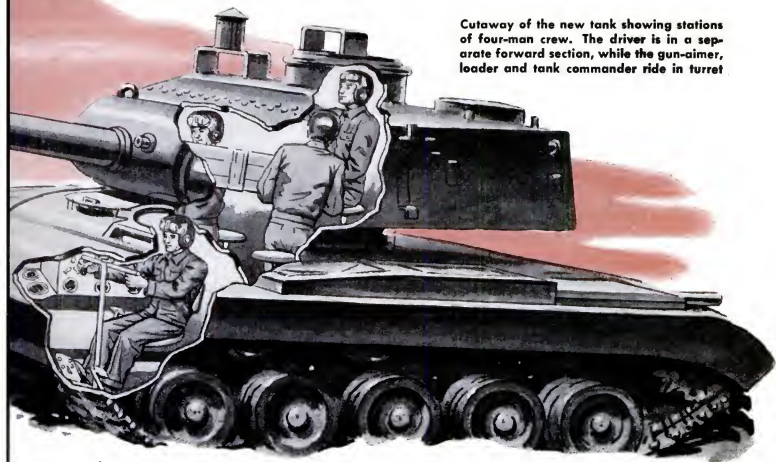
Around the Test Track in a **WALKER BULLDOG**

By Aubrey O. Cookman, Jr.

Light but tough, the T-41 can take it and dish it out. It has a really low silhouette



Cutaway of the new tank showing stations of four-man crew. The driver is in a separate forward section, while the gun-aimer, loader and tank commander ride in turret



ARMOR with a sprinter's speed, a deadly wallop and a tough "skin" has started to rumble off our production lines.

Take it from me. I just sped the Army's latest and finest lightweight land dreadnought around the three-mile test track at the Cadillac tank plant at the edge of Cleveland. The first truly postwar armored vehicle, it gives a tip-off on what to expect in the mediums and heavies soon to follow.

I was the first magazine writer to get a chance to drive the new T-41, which will be much better known before long as the Walker Bulldog. It is named after the late U. N. commander in Korea, who was a great exponent of armored power. In fighting shape it will tip the scales at 51,000 pounds and zip along at a remarkable 40 miles an hour.

This was my first time inside a metal monster. Slide through the driver's hatch, if you're likewise a novice, and I'll pass along a few easy lessons on how to make a Bulldog do everything but turn hand-springs. It is at least as simple as driving the family car.

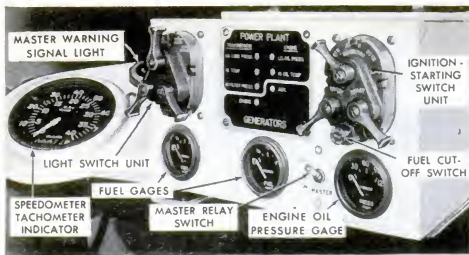
You won't be cramped, but there is no waste space in the driver's compartment. It is ahead and to the left of the gun turret, as the tank faces forward. An impressive-looking 76-mm. gun peers reassuringly over your right shoulder. Two machine guns are likewise poised above and behind you, ready to speak their deadly chatter if needed.

During this ride you'll travel as the armored men do—when folks aren't taking pot shots at their vehicles. Only your head will show as you perch on an adjustable height stool, looking like a man in a giant steam cabinet. Chest-high ahead is an upright T-bar, your steering wheel. Press a button behind and below the bar and a 500-horsepower air-cooled engine whirs into action. Pull back the gearshift lever beside your right knee one notch, push the tilted accelerator pedal and you're off!

Once the tank is rolling, pull the gearshift back another notch to high and you're ready to go faster than any tank in combat status today. The T-bar steering isn't quite a match for the fingertip control of passenger cars, but you'll be amazed at how little muscle it does take to maneuver your 26-ton steel "lizzie." The faster you go the easier it steers. Agile and quickly responsive, it can pivot on a dime.

Generally, you, as the driver, are cut off from the other three members of the tank team, though under certain conditions you can move into their section. In an emergency you pull a lever that drops your seat—and you—through a trap door. Thick padding on the sides and top of your compartment will protect your head and shoulders when you hit rough terrain.

The tank commander sits high in the turret, always in a protected position to see in every direction. On a level about a foot below and ahead of him are a gun-aimer



Compact and easy to use is the instrument panel of the tank, above. The warning lights tell the driver of engine trouble

Only two forward speeds and reverse are needed, thus simplifying the job of shifting gears. Here is the tank shift lever

There's no waste space in the driving compartment. In an emergency, the driver drops through a trap door to the ground

and a loader. They are on either side of the gun's breech. The exact amount of space inside the turret can't be divulged, but the three stations are arranged so that the possibility of any interference during firing is remote. A "bustle" overhang at the rear of the turret provides added space inside for tools as well as serving as a counterweight for the long gun barrel, the biggest the U. S. has ever had on a tank this size.

Armor experts are quick to point out that there is no such thing as a perfect tank, one that can do everything effectively under all conditions. As designers and planners, their realistic goal is to emphasize in each of the tank categories—light, medium and heavy—the characteristics required to do particular jobs best. To do this they have to trade back and forth among three basic-design features—firepower, mobility and protection—and strive for the most effective compromise of purposes.

Military tactics and the



DOME LIGHT
DRIVER'S HATCH LOCK LEVER

STEERING CONTROL GRIPS

HAND THROTTLE
DRIVER'S SEAT TRIP LEVER

BRAKE PEDAL

PORTABLE FIRE EXTINGUISHER

DRIVER'S SEAT

DRIVER'S HATCH CONTROL LEVER

HEATER FUEL PUMP

INSTRUMENT PANEL

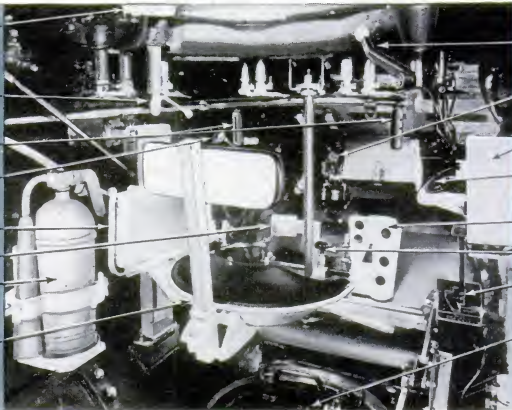
SPEEDOMETER TACHOMETER

ACCELERATOR PEDAL

PRIMER PUMP

GEARSHIFT

ESCAPE HATCH





Today's tanks can "breathe" underwater and ford streams easily. Here, one of the heavier models, M-46, goes through its aquatic-test program

fighting locale likewise influence current design. We, for example, stress the tank as a thrust-in weapon, able to dash deep behind the enemy lines in sweeping moves around their flanks. In Europe, the Nazis struck first with dive bombers, as interference, then smashed through with tanks. The Russians look to their armor for frontal assaults, a toe-to-toe slugging type of combat. As a result the pride and joy of the Red tankmen is the 57-ton Joseph Stalin III, slow by our standards but extremely thick-skinned and bearing a tremendous 122-mm. gun. Our equivalent of the Stalin is expected to trade weight for speed and about the same firepower as the Russian model. Army Chief of Staff, Gen. J. Lawton Collins, says he believes it can defeat any other known tank.

The thickness of the Bulldog's steel is a secret, but it can be said that American manufacturers have perfected methods of turning out metal that affords equal or better protection with less poundage. The steel treads also get a new treatment that makes them extra tough and hard. All these things will afford better protection without the penalty of unwieldiness.

(Continued to page 266)



Dropping the turret and its "basket" into the lower part of the tank. A skilled producer of tanks in World War II, Cadillac is making the T-41 at its plant on the edge of Cleveland. Below, mud, deep ruts, steep inclines or sand do no more than slow down the Bulldog's 51,000 pounds

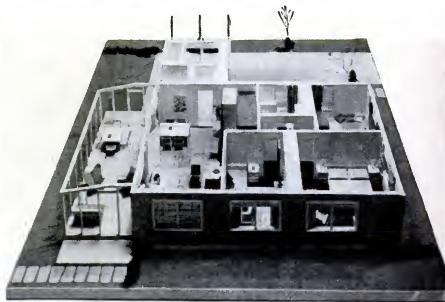


PACKAGED RANCH-STYLE HOMES



Packaged home, above, is almost identical with those ordered for shipment overseas to house State Department employees

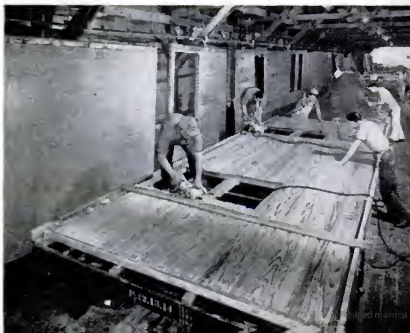
PACKAGED ranch-style homes, made in Baton Rouge, La., are en route overseas for families of 50 State Department employees in Liberia, Saigon, Teheran and The Hague. Each complete package leaves the states as 42 bundles, occupying cargo space equal to the living-dining room area of the assembled three-bedroom house. Everything needed for erection is in the bundles, except the pea gravel for the roof, some of the foundation materials and stucco for one of the models. The bundles include complete wiring materials, plumbing fixtures, paint, electric range and refrigerator. To adapt the houses to extreme ranges of temperature encountered overseas, they will have casement windows for a maximum of breeze, two inches of glass wool in the ceiling and a 42-inch overhanging roof for protection against sun and rain. All wood items are treated with a special preservative that combats shrinkage and rot. The Government's contract cost for the homes will be less than \$7000 each.

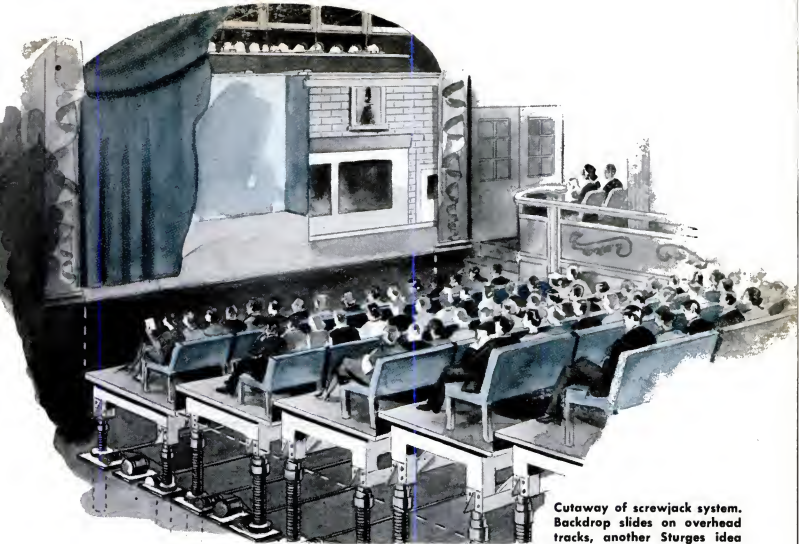


Domestic model of packaged house includes three bedrooms, living-dining room, kitchen, laundry, bath and screened porch

Below left, fork lift truck handles six prefab wall sections at once as houses are being loaded for overseas shipment

On the assembly line at Baton Rouge, La., plant, workmen apply wood siding to a complete wall section of precut home





Cutaway of screwjack system. Backdrop slides on overhead tracks, another Sturges idea

Elevating Floor Converts Night Club to Theater

MOST FOLKS THINK of a night club as a place to "raise the roof," but in one Hollywood, Calif., club it's the floor that is raised instead!

The floor is divided into panels which are elevated to convert the smart dinner-dance club into an intimate theater. When curtain time arrives, the tables are removed and the seats arranged in rows. The floor panels go up, the house lights dim and an evening at the theater begins.

Preston Sturges, noted playwright, director and restaurateur, designed the unusual floor-raising machinery. Most ele-

vating systems use hydraulic lifts—an expensive system that Sturges had to rule out for economy reasons. His mechanical screwjack system, with power provided by electric motors, does the job smoothly, quietly and at a cost estimated at one-tenth that of hydraulics.

The floor is built in sections, each measuring 7 by 24 feet. Four jacks support each section and are driven by a 1½-horsepower motor. Because one motor drives all four jacks in each section, there is no problem of synchronizing—the sections remain level automatically as they are lifted.

Sturges points to one of the four screwjacks that elevate each floor panel. Motor is in front of him

View from the stage shows the theaterlike arrangement of seats made possible by the elevating floor





Fastest Combat Plane Gets Extra Punch

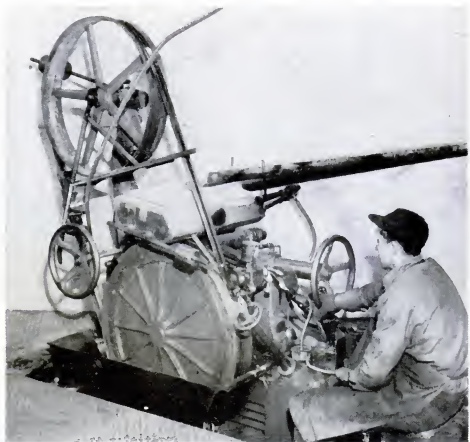
Newest knockout punch for the holder of the world speed record, the North American F-86 Sabre, is the 2.75-inch "Mighty Mouse" rocket. Though fired in salvos, a hit by just one will cripple the largest bomber now flying. Stabilizing fins, which fold into the rocket's tail when it is carried in the airplane, snap out to steady the missile in flight. The burning fuel creates a golden glow at the rocket's tail.



Continuous Metal Casting Process

Aluminum is turned out in a continuous casting by a new machine made in Italy. The machine has a casting wheel and produces a bar triangular in cross section, measuring $\frac{7}{8}$ inch on each side. In the U. S., the machine is used to make bars which are then rolled into rod and wire. Scrap losses in the machine are held to one percent, with scrap remelted instead of being discarded.

ⓈTires for today's massive jet bombers must each be able to support 60,000 pounds, almost double the weight resting on each tire of World War II's heaviest plane.





Triple-Threat Transport

Four engines power a jet version of the Air Force's XC-123, a troop and cargo-carrying transport. It is believed to be the

first aircraft to have flown jet powered, piston powered and as a glider. Each General Electric J-47 engine is rated at 5200 pounds of thrust. The plane exceeded 300 miles per hour on its first jet flight.



German Railroads Add New Trains

German railroads, bounding back from the destruction of the war, are modernizing with diesel locomotives and passenger-car innovations. The new coaches have radio receivers built into the headrests of the seats so passengers can hear programs as they ride. Another innovation is sleeper seats for second-class coaches. These seats can be adjusted to form a soft, level sleeping space where budget-minded tourists can rest comfortably during overnight trips.

Above, powering a new German train is a triple-unit diesel locomotive. Below left, second-class passengers can convert their seats for sleeping. Right, built into the headrests, radio speakers entertain the riders





These pipes which disappear beneath the surf carry 5500 barrels of oil an hour to the tanker a mile offshore

Ocean-Bottom Filling Station



BIG U. S. TANKERS are cruising into Tuxpam, Mexico, to fill their bellies with oil from the rich Poza Rica fields. But they don't pull into a harbor, moor at a pier and pump the black gold aboard as they would almost anywhere else. Reason? There is no harbor at Tuxpam. The tropical oil terminal lies on a 500-mile stretch of unbroken Gulf Coast beach, midway between Tampico and Vera Cruz.

The ships load their cargo more than a mile at sea, via submarine pipe lines that snake out across the bottom of the Gulf. The pipes terminate in 200 feet of hose with ends capped to keep the ocean out. Lines attached to the hose ends are marked by wooden floats. These floats are hauled aboard the ship, followed by the hose which is hitched to the ship's manifold. The pumping station on the beach then goes to work, forcing 5500 barrels of crude oil per hour out under the sea and into the tanker.

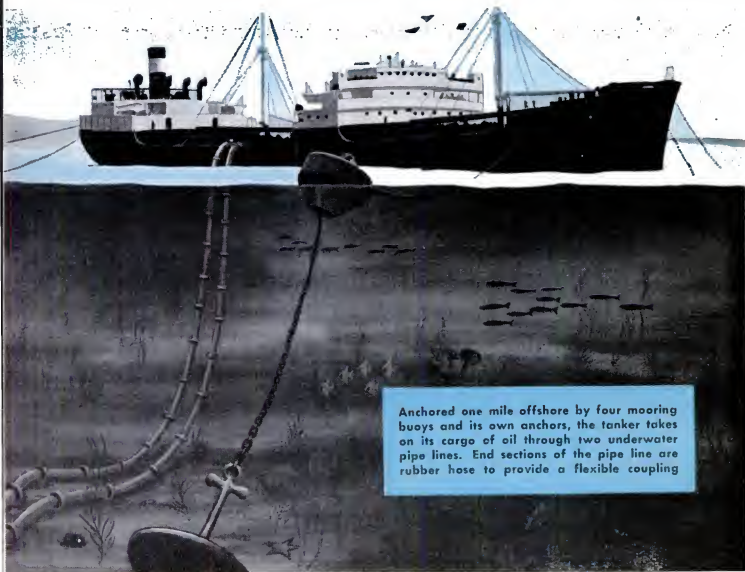
To keep a ship in position while she's loading, the Mexican Government's Pemex Oil Company anchored four giant buoys to the Gulf bottom. Each buoy is a 12-foot-diameter steel drum, held in place by huge steel or concrete anchors. These anchors

hold the 600-foot ships fast against wind and currents.

One at a time, four 10-inch mooring lines are drawn out across the swell to the mooring buoys by a pair of Pemex launches and the ship is securely lashed down like a spread-eagled giant.

The launches themselves are specially built. Forty feet long, they are self-righting and self-bailing. "In a bad sea you can shut yourself in and it's like being in a barrel," explains one skipper. "They can roll over and over and always land right side up." Their double bottoms and high propellers prevent damage when they thump over the sand bar across the mouth of the Tuxpam River on every trip. Occasionally, one is left high and dry on the bar. When that happens, the men just leave the boat there until high tide and wade home.

Transferring a tanker's lines from launches to a buoy in a rough sea requires exact timing. The Mexican seaman who does the job, times his leap when both launch and buoy are riding a wave crest. If he misses, he gets fished out and tries again. In tying up the ship, the 200-pound loop on the end of the line is made fast to the buoy's five-foot steel clip. Simply by



Anchored one mile offshore by four mooring buoys and its own anchors, the tanker takes on its cargo of oil through two underwater pipe lines. End sections of the pipe line are rubber hose to provide a flexible coupling



Standing on a mooring buoy is easy when the sea is calm, but you should try it when the Gulf acts up!

If a squall comes up suddenly, a blow of the hammer releases the clamp, allowing the hose to swing free

releasing the catch that springs the clip open, lines can be let go in a split second—an important factor in the changeable Gulf weather.

"'Northerners' blow up without warning," says Capt. Joe Tibbetts, skipper of the Sinclair Oil Company's tanker flagship, Sinco. "I've seen such a storm catch these 600-foot ships at the mooring, tear the anchors loose, snap the hoses and send oil flying all over the Gulf before we could call for a shutdown. Broken hoses on the ocean bottom are tough to repair."

To minimize this hazard, hoses now are coupled to the ship's manifolds by steel clamps. During loading, a man stands by with a sledge hammer. If any movement of the ship draws that hose taut, one whack with the hammer knocks the clamps loose and the hose flies overboard spouting oil. The ship may get an oil bath from stem to stern, but at least the hose remains intact and no time is lost in repairs which would prove costly and difficult.

Some day, Tuxpam hopes to dredge a channel up its river, through which ocean tankers will forge their way to a loading pier. Meanwhile, the tankers will continue to load their bunkers a mile at sea at one of the most unusual filling stations in the world.





Panels resist stains, wipe clean with a damp cloth. Above right, plastic-surfaced molding frames windows. Right, molding strip holds panels, covers joint

Solid Plastic Wallboard

Large panels of solid plastic are easily installed on kitchen and bathroom walls and can be wiped clean with one swish of a damp cloth. The plastic wallboard eliminates the need for insulation of any type. Measuring $\frac{3}{32}$ inch thick, it is applied directly to the studding. No glue is required, as the panels are held in place with metal moldings, surfaced with plastic with the same design, color and texture as the wall panels. When the molding strip is nailed into the studding it holds two adjoining panels and covers the joint. The plastic is chipproof, cigarette burnproof and stain resistant. It is impervious to food, hot coffee, boiling water, fruit acids and alcohol.



Photos Developed 10 Times Faster Without Washing

Films and prints can be finished without the customary washing in water in a new photographic process developed by the Army Signal Corps. The process is about 10 times faster for films and twice as fast

for prints as the conventional method. The photographer uses a special developer, a stop bath and stabilizer solutions. Water-resistant photo paper is used to cut down drying time.

REVIVING THE ANCIENT



Part of an American artist's home in Lima, this tiny workshop is the scene of a rebirth of Peruvian art

DOWN IN PERU there has been a revival of native Andean craftsmanship led, strangely enough, by a Yankee from Portland, Ore. Once part of the culture of Peru, skilled handwork in wood, leather and silver had become a victim of progress until Truman Bailey, Oregon artist, went to South America in 1942.

Bailey was sent to Peru by the Inter-American Development Commission. During his first year in that country he studied the techniques of the forgotten Andean arts. Traveling through the interior, Bailey unearthed many fascinating and ancient examples of native artistry—

rare primitive pieces which he used as models for his work.

Vegetable dyes provided a fertile field for his creative mind and he developed about 450 different types. His research and exploration taught him the characteristics



Left, artist Truman Bailey holds a reproduction of an ancient Inca figure which he found and sketched during a year of research in the highlands of Peru

Below, the three mounted kings were carved in wood by craftsmen in Bailey's shop and were adapted from original carvings made during Peru's colonial days



ANDEAN ARTS

Highly skilled Barsabas Cisneros carves this ancient ceremonial bull in tropical hardwood, one of the hardest woods known

of more than 250 varieties of native wood. Some of these woods are so hard that he had to devise tools for working them.

When his year of study was over, Bailey teamed up with Grace Vallejo, a native of Lima who had studied art in New York. Together they launched an art program which has revived, as they had hoped it would, the long-forgotten skills of Peru.

Students and workers familiar with the ancient hand techniques on metal and wood were impossible to find. Bailey found it necessary to hire unskilled workers and teach them the skills of their ancestors.

Started as a school in Andean art, the Bailey enterprise is now a profitable business. The workers have become highly skilled and many have left Bailey to start art shops of their own in the provinces of Peru. Already 300 Peruvians have learned the skills that once were native to their country—learned them from a Yankee from Oregon!

Below, two bowls, each hammered from a piece of silver, and a delicate deer are examples of the Peruvian's work in metal



Above, Bailey's partner, Grace Vallejo, watches a student pound out a silver tray. Below, these chessmen were carved by Bailey





Above, folded to fit in a survival bag, the gun is only 15 inches long. It opens to 30 inches for use, top right. Firing is done with a lever-type trigger that can be used while wearing heavy gloves in the Arctic. Right, shells are carried in the stock



Survival Gun for Flyers

Airmen forced down in the Arctic or other uninhabited regions will be able to protect themselves and provide food for survival with a combination rifle-shotgun developed by Army Ordnance. The gun has two barrels, one mounted above the other. The rifle barrel takes a .22 Hornet cartridge and the shotgun barrel takes a .410-gauge shell. The weapon weighs only

3 pounds 11 ounces and folds to measure only 15 inches overall. Ammunition can be carried in the stock. Its accuracy range is 100 yards for the rifle and 20 yards for the shotgun. An unusual detail is the shotgun-shell casing. It was found that paper shotgun shells split open at 40 degrees below zero, so aluminum shells are used. Possible use in the Arctic also eliminated the trigger guard, permitting a heavily gloved finger to fire easily.

75-Foot "Camera"

Built like a giant camera, a 75-foot cone-shaped chamber is used to measure the light output of street lamps at the General Electric Laboratories. The chamber focuses the light upon a test stand at the "lens" end of the "bellows." Circular baffles keep the light rays from being reflected in the darkened chamber. Illumination is recorded on a light-intensity meter.

Popular Mechanics provides two sources of information concerning articles published in each issue; the WHERE-TO-BUY-IT INDEX on pages 12, 14 and 16, and the WHERE-TO-FIND-IT LIST, available without charge from the Bureau of Information, 200 E. Ontario, Chicago 11





Minneapolis Morning Tribune

Bureau Opens Core Library

Bookworms would feel lost in a library set up by the Bureau of Mines in Minneapolis. The "books" are drill cores, the cylindrical ore cuttings that are taken from the earth during mineral exploration. Cores from hundreds of test borings in the North Central part of the nation are catalogued and stacked in 72,000 boxes. Five other libraries contain cores in other sections of the country. By preserving and indexing these ore samples, the bureau has available an accurate inventory of ore. With them, engineers can study the mineral content of various regions without the expense of making new test drillings. Examination of old cores, the Bureau points out, is fundamental in discovering new mineral resources.

Doctor's Camera

Interiors of body cavities such as the eye, ear, mouth, nose and throat are photographed by a special medical camera designed by Capt. Harry R. White of the Air Force School of Aviation Medicine. Although not recommended in scientific practice, it is possible for a dentist to photograph his own teeth using the camera. A tilted mirror provides the image which the small camera copies. Small and compact, the camera is known as an endoscopic, or internal, camera.



Midget Magnet Has Powerful Grip

Many times more powerful in small sizes than the famed Alnico magnet, a cobalt-platinum magnet has been developed at General Electric laboratories. Present use of the magnet is limited by restrictions on the use of cobalt and the expense of the large amounts of platinum used in the alloy. Strangely enough, the new material is less powerful in large sizes than the Carbonyl Alnico. Only in the smaller types is it superior. Other advantages include its ability to be drawn into thin sheeting and wire and its comparative ease of machining. Early work on the new alloy was first done in 1935 by German scientists.



Dave Garroway, whose show sparkles with trick effects, is "on camera." Note the forced-perspective set at rear

THEY FOOL YOU *Every Night*

You aren't likely to applaud the actors performing on your TV screen. But save a round of mental hand-clapping for the wizards behind the screen who trick you into believing the illusions you see

By Arthur R. Railton

VISITORS TAKING the guided tour through Chicago's Merchandise Mart marvel at NBC's television studios on the 19th floor. If they're lucky, they may even get to see a star putting on a show. But the guided tours never include a busy, sawdust-sprinkled "studio" where little-known but important TV "stars" turn out their

hit performances with saws and hammers.

These stars, whose scripts are blueprints and whose costumes are overalls, are helping make Chicago's television shows the envy of the networks. They are the scenery builders and special-effects men who fool you via video every night.

Maybe "fool" is too strong a word—they

POPULAR MECHANICS

create effects that make you think something is what it ain't! These TV tricksters take you into a "vast" department store (actually it's only six feet square) or shoot arrows into a tree right past your ear (don't worry, the arrows come out of the tree and not through the air). It is the old magician's repertoire dressed up in electronic trappings. And they have to be good enough to fool the millions of viewers, each sitting front-row center, thanks to TV.

Most famous for its trick effects is the Garroway-at-Large show from NBC-Chicago. It's as casual as your favorite pipe and as surprise-packed as a magicians' convention. The stars of the show and the idea-people behind it are young, daring and unafraid of new ideas. So many trick effects are used in the show that among some wits in the business it's known as "Gimmicks at Large, with Garroway."

The special-effects man, who has to translate the clever ideas into something that works "on camera," has a peculiar combination of talents. He is a carpenter, painter, electrician and inventor all rolled into one. You'll find such men in the scenery shop at NBC-Chicago. Weeland ("Wee") Risser, boss of the scenery shop, is a veteran of the legitimate stage and he's never failed

to make a "gimmick" work yet! His right-hand man is Ralph ("Buddy") Doremus, who spent 15 years with Blackstone, the magician. Others in the scenic shop have worked in Hollywood. When there's a tough problem, it's a good bet that somebody in the shop will have a working solution in a few hours. They have to because they have only a couple of days to "do" the whole show!

Many stunts are direct "steals" from the magician. The shooting-gallery trick is an example. The camera (and you, of course) is looking from behind the targets toward the customer (Dave Garroway). He aims the rifle, fires and the target (a china duck) smashes to bits as though hit by the bullet. How? It's as simple as a mousetrap because that's what it is—a mousetrap. Under each china duck is a cocked mousetrap with a large nut soldered to the snapper arm. When a stagehand pulls a string to set off the trap, the arm swings up and the nut hits the duck, smashing it. Any number of targets can be set up, each with a mousetrap beneath it.

The punch-line of the trick comes when Garroway aims directly at the camera and fires. Smash! A huge crack appears on your screen. But nothing is broken, nothing

On his show, Garroway called this trick the "girl multiplier." It's so simple it fooled New York's TV experts for weeks. Camera, below, shoots through a plastic building block, picking up scores of images of the girl in midget size, right





How long will it take him to sweep the corridor? It seems to be at least a block long, don't you think?

Here's the same set with the illusion destroyed — it's six feet long! Forced perspective makes the effect

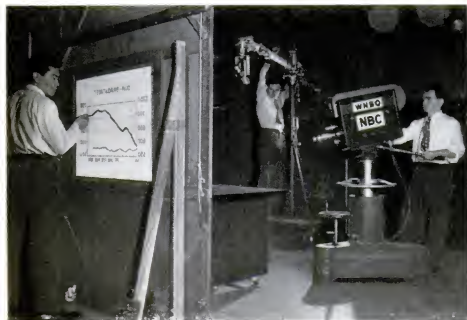
except a piece of plate glass in the studio. Another mousetrap did the job as the camera was looking through the glass.

The trick that scored highest in audience response had Risser and Doremus playing the star roles, although the television audience never caught a glimpse of them. It was during a baseball skit, featuring comedian Cliff Norton and Garroway. Norton was the catcher and Dave the umpire. Eddie Robinson, of the Chicago White Sox, was playing the guest-star role as batter.

The subjective-camera technique (a favorite with director Hobin) was used. In the skit, the camera played the part of the

pitcher. You, the viewer, saw the game, therefore, exactly as though you were the pitcher in the game.

When the pitcher began tossing the ball across the plate, there was no question but that the Risser-Doremus combination was involved. The ball did everything a pitcher must dream he will be able to do with the ball in paradise — it followed a corkscrew course, it zigged, it zagged, it swooped up and down, spinning dizzily all the while. Each time, by some miracle, it ended up in the catcher's mitt, leaving Robinson standing there with his bat still on his shoulder. Once, accidentally, Norton muffed a pitch and the ball rolled across the studio floor. He leaped after it like a professional and snared it beneath his mitt before it got away. On the floor, it rolled as freely as any ball does!



Risser refuses to say much about the ball trick. "Every magician in the business would be after me, if I did," he explains apologetically. But this much is just about certain

On your TV set, the graph line appears as if by magic, but the artist, hidden behind the set, draws it while you are watching



When this shot of a Garroway show was made, the camera (partially visible at extreme right) picked up only the crowded-window shot you saw on your set, below. This tiny stage looked like a huge bedroom on the screen

—there was a string of some kind involved and, more important than that, there was an especial amount of skill from the Risser-Doremus combination, unquestionably performing somewhere out of camera range.

In one show, the whole cast including the orchestra appeared to be hiding behind a scrawny tree only six inches in diameter. One by one, they stepped from behind the tree that was obviously too small to conceal any more than a clarinet much less a whole orchestra! The split-screen technique was used. One half of the tree was set up on one side of the scene, the other half on the opposite side. Between the two halves was about 10 feet of "No Man's Land" invisible to the viewers at home. Two cameras shot the tree halves and they were combined in the control room to form one tree, omitting the area in the middle where the cast lined up before stepping from behind the tree!

Like to take a rocket to the moon? Or to any star in the universe? The special-effects department will hand you a ticket guaranteeing safe arrival. And you'll never leave the ground. All you need are a revolving drum covered with a cloud-effect strip and a transparent disk on which is mounted a tiny rocket. A stagehand turns the drum slowly and the clouds move down behind the rocket, making it appear to be



climbing rapidly. Then the disk is carefully turned so the rocket seems to be leveling off for its trip to the moon. When seen on your TV set, the whole effect is realistic and, if you join in the fun, you can easily believe the trip really happened.

This same effect is used to show various falling objects. A bucket was shown falling from a skyscraper. If desired, the bucket can be thrown up from the ground to the top of a building with the drum. The "snapper" was when a cutout photo of Garroway was pasted on the disk and he seemed to be falling from the top of a building!

But not all clever effects are on the Garroway show, although sooner or later they do seem to appear there in some form. The



Burr Tillstrom conducts his Kukla, Fran and Ollie show from this position behind the screen (on which you can see the shadows of Kukla and Ollie). He has a monitor, at right, so he sees what you see, below

Wayne King show wanted to do a picnic scene with a river flowing through it. Stan Rames, set designer for the show, roughed up a sketch and gave it to the scenic shop. They shrugged their collective shoulders, muttered, "What next?" and built a river!

Four wooden troughs, lined with canvas painted to resemble a creek bottom, were lined up to form a curving stream. Each downstream trough was made to retain a water level an inch lower than the preceding trough. Hence, a realistic flow was created as the water flowed from one trough to the next. From the end trough, a pump moved the water upstream to the first trough and the cycle was repeated. Rocks, branches, some cattails and other decorations completed the scene. The singers waded up and down in the stream in an extremely realistic picnic setting.

Not all the trick effects are the work of some special-effects "brain." Many are strictly accidental. The "girl multiplier" is an example.

Rames, who formerly designed sets for the Garroway show, saw a new type of "glass" block made of plastic in a store. It was ribbed on each side and it came apart in the middle. He held it up to the light to see how transparent it was and discovered that it produced a separate image for each rib. By reversing the ribbing so those in back were at right angles to those in front,



he multiplied the images many times. Fascinated, he bought a couple and showed them to Bill Hobin, director of the show. Hobin agreed it was a good trick and it was worked into one of the shows as the "girl multiplier." You saw almost 100 images of singer Bette Chapel as a result. Incidentally, New York TV directors tried for weeks to get the multiplier secret from NBC-Chicago. Finally, Hobin sent them a block and in a couple of weeks he saw it used on a Gotham show.

Another accidental discovery rescued a

special effect from oblivion at the last minute. A two-way mirror was involved. That's the mirror that reflects in either direction, depending upon which side is lighted more brightly. It was used in a dressing-table at which Connie Russell sat to do her song. The trick was supposed to result in Garroway's image appearing on the mirror to replace Connie's. It was to be done simply by increasing the light intensity on the back side of the mirror where Garroway sat. But the effect fell flat. Director Hobin kept calling for reruns to snap up the trick, but it looked like a conventional electronic dissolve, which he could get merely by pressing a button in the control room.

He was about ready to forget the whole trick and do the number straight when one of the electricians, bored with the delays, began swinging his spotlight back and forth. The light jumped from Connie to Garroway and back again. What appeared on the screen was amazing. Heads and bodies were all jumbled in a startling fashion. After a few practice runs to polish up the routine, the new trick was ready for the show — only about an hour before dress rehearsal!

Arrows "thud" into trees, but in reverse. Held inside the tree by an elastic, they pop out so fast when released that you swear they come from the bow. They even quiver!

But the best arrow stunt was in "William Tell" on the Magic Slate show. The actor playing Tell shot the apple off his son's head. He could have done it blindfolded, if



By taping a cloud strip over the drum and rotating it, the TV tricksters "fly" the rocket to the moon

necessary, it was so foolproof. A hollow arrow was used. As it left the bow, it slid along a taut length of piano wire into the apple which was slit to fit down over the wire when placed on young Tell's head.

Chicago NBC shows are leading the nation in forced perspective. Designers have

When the script calls for a broken window, a mouse-trap machine is placed in front of the camera lens



Setting off the trap shatters the glass. Traps also break the targets in scenes at the shooting gallery



It's easy to get an elephant for a television show. The scenic shop will build as much of it as you need

been required to specialize in this because of the small studio sizes. With forced perspective, a space as big as an apartment kitchenette becomes a "never ending" department store. A narrow strip of floor becomes the Champs Elysees with the Arc de Triomphe in the background and a sidewalk cafe in the foreground.

A skillful use of lines in greatly exaggerated perspective coupled with a short lens in the camera give the effect of spaciousness. The Garroway-show designer, Miss Jan Scott, is a pioneer in this field in TV.

Not falling precisely in the special-effects category, but still a master at creating impressions is Burr Tillstrom of the famous Kukla, Fran and Ollie show. Tillstrom provides his own special effects and as a result there are millions of fans all over the country who are convinced the Kuklapolitan Players are real. Tillstrom works behind the curtain, his arms and hands controlling the performers. To be sure he

makes the "kids" (as he calls them) perform properly, Tillstrom watches the show on a monitoring set beside him. He sees exactly what you are seeing, although he never gets to see the kids directly!

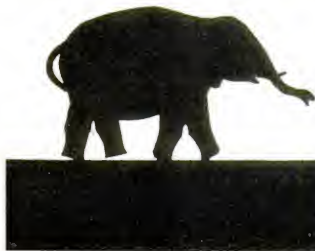
Even a news program can use special effects to advantage. Not quite so spectacular as most effects, a novel moving graph does make the statistical material more interesting on the Clifton Utley news program. The lines of the graph appear as if by magic on the wall as you watch. Utley's map artist, Yoichi Hara, stands behind a sheet of translucent paper and draws the line. His brush paints the line smoothly in one continuous stroke and, the paper being translucent, the "moving" line is clearly visible on your set.

Television has drawn a wealth of material and talent from other branches of entertainment. Veterans of Hollywood, Broadway, radio, the circus and other mediums all are found working around a typical TV studio. But, of all the branches, television is the most exhausting.

"Imagine building all that scenery for a 30-minute performance," said Risser as the crew assembled the picnic scene for the Wayne King show. "We've had a crew of eight men working on that for two or three days just so you folks can watch a picnic for 30 minutes!"

How long television can keep coming up with new tricks is anybody's guess. Some say the supply will soon be exhausted, others say it's unlimited. Whatever the outcome, there's one certainty — if the ideamen can think up the tricks, the special-effects crew will make them work!

Distant shots of the elephant in motion are faked by a cutout with hinged legs that actually walk along a narrow track when the stagehand pulls the string





Sheep fed a fantastically high amount of radioactive material remain in good health despite their test diets

"Atom Fed" Animals Test Radioactivity

You'd have to eat, at a single sitting, 100 pounds of salmon caught in the Columbia River just below the Hanford atomic-energy plant to take into your body even a noticeable amount of radioactivity. General Electric scientists in charge of keeping radioactive materials from contaminating the area are raising sheep, fish and rats on special diets. Varying amounts of radioactive materials are fed to the animals

Fish are raised in the Columbia River and checked for radioactivity to study possible effects of atomic waste



OCTOBER 1951

along with their regular food, and the creatures are checked to determine the harmful effects of the diet. The sheep getting even the maximum dose — a fantastically large amount — remain in comparatively good health. The scientists also check water and air samples in the vicinity of the plant. The surveys show that the amount of radioactivity escaping from the plant is so insignificant it has no ill effects whatever.

Biologists keep a continual check on white rats after they are fed minute doses of radioactive materials



WHAT'S NEW FOR Your Home



OZONE LAMP, above, rids the air of unpleasant odors three times faster than previous models. The lamp generates ultraviolet radiations of a special wavelength, transforming the oxygen into ozone, an air purifier. It is used in a special wall fixture



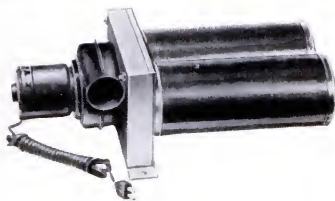
CARD-TABLE RACK, left, screws to the baseboard of a closet and supports folded tables so they won't fall over. Sturdy enough to withstand rough usage, it holds any card table. It comes in two sizes, one for two tables, shown here, the other for one table

SEAM RIPPER, below left, clamps on the table edge to cut stitches cleanly and quickly. A special guide follows the seam, preventing any damage to the fabric. Clamped down, it leaves both hands free to slide the fabric past the razor-blade cutting edge



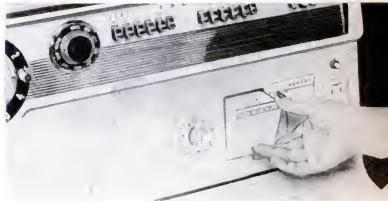
INFRARED COOKER, below, not only broils, but also grills and fries simultaneously. The infrared element in the bottom heats the aluminum grill uniformly. Food can be broiled at any of four cooking levels. The element is rectangular to prevent uncooked edges





INDOOR VENTILATOR actually removes gases and odor vapors from the air by adsorption. The motor-driven blower draws the room air through activated-carbon-filled canisters. Odors are extracted from the air in much the same way sponges soak up water

SLIP-ON DUSTER fits over a broom to convert it into a fluffy duster for cleaning over doors and windows or under the bed. The straw portion of the broom is encased in a cotton sleeve that ties around the handle. The duster can be washed out in a jiffy



HEATED SHAKER, built into the splashboard of an electric range, keeps the salt flowing freely no matter what the weather is like. A tiny electric heating element beneath the shaker does the trick. The same new range design features a built-in pressure cooker

PAN CADDY prevents burned hands and eliminates use of pot holders. Tines of the lifter slip through the oven grill and under utensil. Wire guards make it impossible for the pan to slide off the lifter. It can also be used as a hot pad and an iron rest





Baby Hitches Ride on Father's Bike

When a German cyclist takes his infant son out for some air, he does it the easy way. He built a one-wheel trailer that he

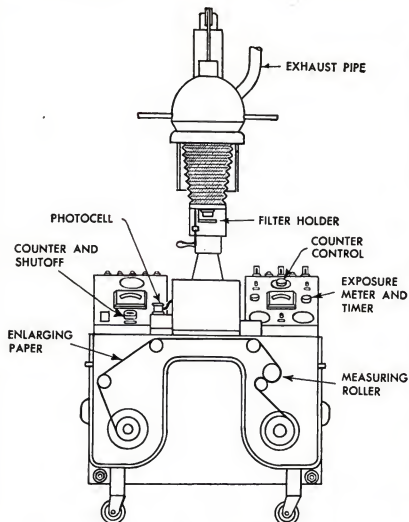
hooks to his bicycle so he can pedal the child around the park. There is a wind-shield to keep dust out of the child's eyes.



Plastic Irrigation Flumes Replacing Concrete Ducts

Light in weight and easily assembled by one man, plastic irrigation flumes are replacing costly concrete ducts in the Hawaiian sugar-cane fields. The half-cylinder sections, made of thin plastic, are held rigid by a small bar across the top. Each section has a drain from which the water flows

to irrigate the field. If a particular section is not required for irrigation, a plastic bag is inserted under the hole, pulled up over the side of the flume and clamped in place with an ordinary clothespin. The flumes can be taken apart and transported to other fields as needed.



Principal parts of enlarger are labeled. Only one grade of enlarging paper is needed as contrast is varied by filters

Enlarger Makes 1500 Prints Hourly

Enlargements by the thousand roll from a projection machine that makes prints automatically, each properly exposed for automatic development. No larger than many professional enlargers, the machine turns off the room lights, inspects the negative and decides on exposure, makes the exposure, moves fresh paper on the easel and shuts off when a preset number of prints is made. It makes 1500 prints an hour if one negative is used, or 350 prints an hour using individual negatives. The machine handles negatives ranging in size from 35 mm. to 5 x 7 inches.

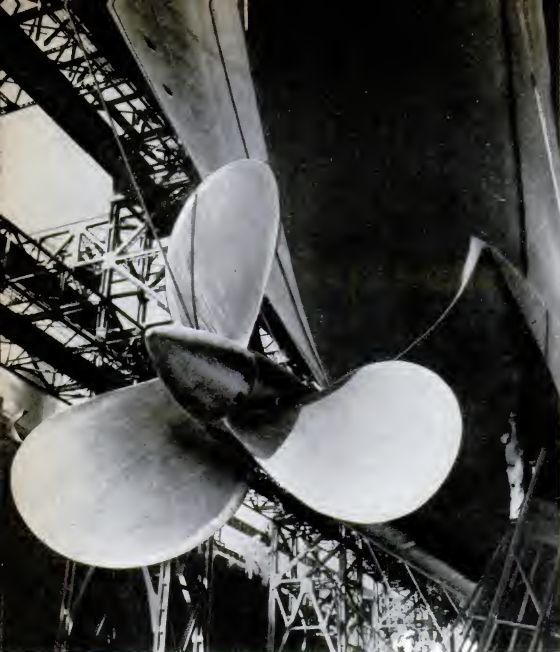
Inventor of the automatic enlarger, Leo Pavelle, watches as mass-produced pictures come from the drier at 1500 an hour



To start the enlarger working, the operator slides in a negative and pushes a few buttons

Even processing is automatic. Exposed paper rolls continuously through tanks of chemicals





Molten metal at a sizzling 2750 degrees is poured from a huge ladle into the finished wheel mold

By
Andrew
Hamilton

Big, graceful "wheel" at last is installed and is ready for action. The propeller is one of few ship parts that need no paint

NOW THAT THE U. S. Navy is scraping the mothballs and barnacles off its warships and the merchant marine is expanding for any emergency, a unique art is stepping into the foreground. It's a business that rises and falls with Uncle Sam's military temperature. It's the business of making big propellers for big ships.

The salty sailor calls a propeller a "wheel." Whatever it's called, it's the throbbing force of the war or merchant ship. Wheels are like men's tailored suits. For a giant aircraft carrier or a large passenger liner, the propeller is carefully made to measure and may require from 4 to 16 weeks to complete. The exception, of course, is the Liberty ship. Its wheel is made from a standard pattern, and turned out in a few days.

After five feverish war years of shipbuilding and six convalescent peacetime years of experimenta-

tion with everything from marine jet propulsion to the newfangled cycloid "egg beaters," the big-ship propeller is still basically the same wheel it was 100 years ago.

The big changes have been in metallurgy—the raw materials of the big wheels, and production — the corner-cutting. The propeller-maker today uses tools his grandfather never dreamed of — pitch planers and keyseaters, pitchometers and dynamic



Ships need wheels of all types. Small one in center weighs only 1000 pounds. Two big ones tip scale at a whopping 54,500 pounds



Big "Wheels" for Big Ships

balancing wheels. But the age-old profession of building wheels to push ships through the water still requires fine craftsmanship in handling wood and metal.

Some of the craftsmen now working on the giant wheels have been on the job 30 to 40 years. Experience is important when a slip of a grinding tool could mar a propeller costing thousands of dollars, and when a 30-ton chunk of metal must be balanced so delicately a child can revolve it.

Bethlehem Steel Company has turned out more than 3000 ship wheels in the past 10 years. At the Staten Island shipbuilding yard, the company makes propellers in all

sizes from 5 to 22 feet in diameter, weighing from 1000 to 60,000 pounds and costing from \$500 to \$30,000.

Every propeller starts on the drawing board of the naval architect who designs the ship. It's supposed to produce the greatest speed with the smallest amount of fuel consumption. And when propellers aren't correctly designed, there'll be trouble.

For example, in World War II a number of Liberty ships broke down at sea or lost their propellers. After the war some 600 Liberty ships were examined to locate the trouble. The check showed that 40 percent of them had broken or cracked tailshafts.

Propellers must be built to exact dimensions or ship is in for trouble. Here a workman checks hub diameter

One of the first five-bladed propellers ever made is this 18-foot, 18-ton job installed on a tanker



Bethlehem decided a propeller of a new design was needed. An experimental wheel was built and installed on the S. S. Calmar. During a round trip of 10,000 miles, a full record of performance was kept. At the end of the trip there wasn't a doubt that the new propeller had proved its worth. Operating at reduced revolutions per minute, it produced less stress on the tailshaft—where the Liberty ships had broken down. Further, it required less fuel and produced about 10 percent greater speed.

The result? During an average year, when a Liberty ship makes 10 or 12 trips to Europe and back, one extra round trip can be included. Multiply this by the 1000 Liberty ships now in operation and you can see the importance of a correctly designed propeller.

Manganese bronze, cast iron and cast steel are most commonly used in making propellers. Navy scientists are said to be experimenting with a stainless-steel propeller for ships that ply Arctic waters. The toughness of stainless steel would lessen damage by ice floes.

As a general rule, propellers for warships are the three-bladed type; those for merchant ships are four-bladed. Within the past few years there have been extensive experiments with five-bladed propellers. Some Naval craft and tankers now are equipped with five-bladers, and the new superliner, S.S. United States, will use two of the five-bladers on its inboard shafts.

Wheel-making requires the utmost in pre-

cision on raw materials measured in tons. The first step is to make a pattern from white-pine segments glued together to the approximate shape called for by the blue-prints. Next the pattern is "rammed up" in "flasks" of dry sand, which are sprayed, heated and dried. Two molds—one for each side of a propeller or blade—are bolted together and molten metal poured into them. Later, after the propeller has cooled from 48 to 96 hours, the excess metal is cut off and the hub rough-bored. Blades are checked for pitch, contour and thickness, and the exact center of the bore is fixed. Finally the wheel is chipped, ground and burnished to exact dimensions. In a final inspection it is tested in static and dynamic balancing machines, keyseated and weighed.

Heaviest wheels ever cast for a passenger ship in this country are those on the U. S. Lines' S. S. United States. Since this ship may be used as a troop carrier, information about her propellers is classified. It is known, however, that they are larger than the 19½-foot wheels recently installed on the American Export Lines' two giant vessels, the S. S. Independence and S. S. Constitution. When cast, these big wheels weighed 74,000 pounds; when finished, they tipped the scales at 54,500 pounds.

Today the wheel business is booming once more. America's propeller-makers, craftsmen in a trade as old as the steamship, are key men in keeping the United States the world's leading sea power.

First step in making any propeller is to carve an exact pattern from wood strips glued into approximate shape. Later a mold is made from this pattern

Almost 20 feet in diameter, this huge wheel must be balanced so precisely a child can turn it. Here it is being checked on a static balancing machine





Sled Runners Convert Wagon for Winter Use

Children can "winterize" their wagons and scooters with a set of sled runners which slip on the axles to replace the wheels. The runners convert such a vehicle into a sled or toboggan which can be

steered. Each conversion kit consists of four runners 15 inches long and $1\frac{1}{2}$ inches wide, machined to fit $\frac{1}{2}$ -inch axles, and a set of $\frac{3}{8}$ -inch bushings to adapt the runners for smaller axles.

Twin-Engine Plane Makes Single-Engine Take-Offs

Engine failure on take-off, a major aircraft hazard, poses no problem with the twin-engine Aero Commander. One was flown from a standing start in Oklahoma City, Okla., to Washington, D.C., with one propeller removed. It is the first multiengine plane believed capable of this feat. It carried fuel and lead-filled bags weighing 4800 pounds. Normally airborne in 600 feet, the craft was off the ground in 2400 feet in the single-engine experiment, flown to test the Aero Commander's performance under simulated emergency circumstances.



Auto-Visor Rack

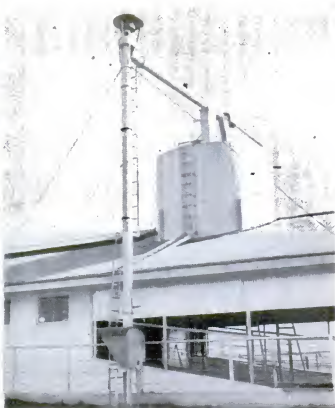
Two coil springs clipped to an auto sun visor form a convenient rack for holding pencils, maps, cigarettes and note papers. Hooks slip over the edges of the visor to hold the springs in place. The rack can be installed on either side of the visor.

☐ Last year, U. S. trucks rolled up the staggering speedometer total of 80 billion miles.





Milker releases lever, cutting off the flow of feed, when the desired level is reached in measuring glass



Feed is delivered to the storage tank atop the barn by vertical and horizontal augers inside these pipes

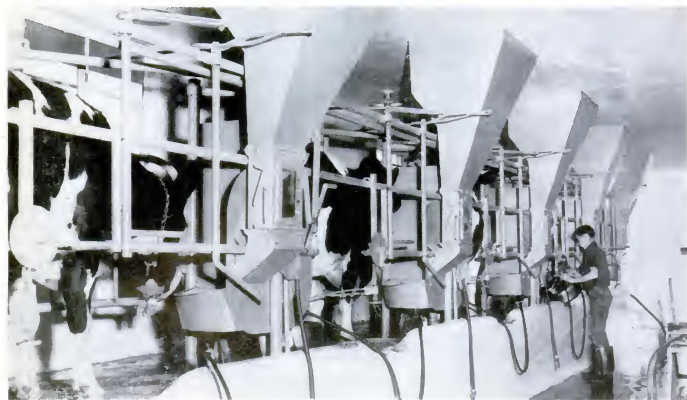
Mechanical Feeder Keeps Dairy Cows Content

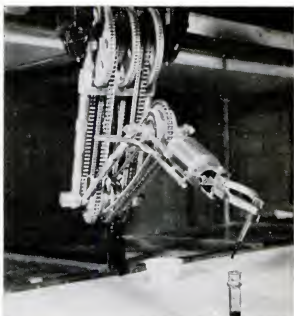
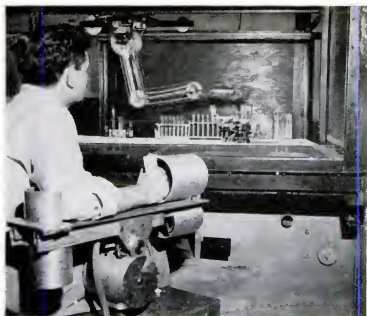
Even the most fastidious cow wouldn't complain at a California dairy farm where the animals are fed concentrates "untouched by human hands." And farm hands like it, too, because it saves labor and time.

The system operates on the farm of Sherman Thomas at Madera, Calif. Through

a series of augers and bins, the concentrates are mixed and carried to feed boxes in the milking parlor where they are eaten during milking. A glass measuring gauge enables the milker to control the amount delivered to each cow, thus permitting him to vary the feed according to milk production.

Over-all view of milking parlor showing arrangement of feed boxes. Ceiling hoppers are filled by more augers





Several feet away, the operator controls the arm from this chair. Right, it can measure out liquid by the drop

"Adelbert"—Science's "Right Arm"— Can Even Write Its Name

ALTHOUGH it looks more like a dentist's oversized drill, a gentle-acting mechanical arm called "Adelbert" is actually built like the human arm. It has an elbow, shoulder, wrist and fingers. Unlike normal arms, it is completely double-jointed.

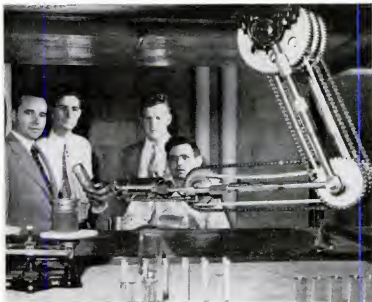
Adelbert's inventor is Art Youmans, who works for a Tulsa company that does radioactivity well logging in surveying oil fields. Radioactive materials often require remote handling, hence the invention of remotely operated Adelbert. Youmans spent 18 months working on his robot.

Similar arms are in use in research labs, but Youmans claims his arm is best. It is versatile. It can snatch up heavy cans or fondle eggs. It pours from slender test tubes as adroitly as a chemist. Even un-

trained operators can pour liquids with Adelbert and not spill a drop. A favorite trick is to pick up a pencil and write its name.

The operator sits in a one-armed chair—the arm being the control. When the operator moves this arm forward by pivoting his arm from the shoulder, Adelbert does likewise. Raise a forearm and the mechanical arm mirrors the action. A pistol-grip bar controls the twisting of the wrist. This movement even outdoes the human arm—it can spin its hand all the way around in either direction. That's handy for screwing nuts on bolts. Open the fingers and Adelbert follows suit. Unaffected by radiation, Adelbert offers safety and deftness—a combination atomic researchers need.

Inventor Art Youmans, left, watches his "right arm" mix chemicals. Right, it is gentle enough to handle eggs





Young and old alike crowd around the giant scale model to watch the amusing activities that take place on board ship—activities common to any liner. It's educational, too, as it shows how a big ship functions

Fortunately, this isn't typical of a real ocean trip. The two sailors are hauling in a passenger who fell overboard, probably while doing a few tricks on deck

There's one of these at every sailing—the late-arrival who just misses the boat and overtakes it in a speeding launch to climb aboard on the ladder





Crew members relax in their quarters as the vessel sails along. Barrels and sacks fill the lower hold



Another passenger goes overboard and the crew is after him in lifeboats. The waves are made of tin

AS ENTERTAINING as a three-ring circus, a bone-dry ocean liner keeps adults and youngsters laughing at its zany passengers and crew. Its home port is a department store in Hamburg, Germany, a city famed for its shipping.

The liner is a scale model of the 20,000-ton "Alsterhaus." Its sides are open to show the interior with dolls as its passen-

gers and crew. Hoists, derricks and other equipment are copies of the originals.

But the real entertainers are the dolls. They illustrate every type of traveler in existence. There's the romantic couple on the top deck, the clumsy oaf who has just fallen over the railing, the last-minute arrival and a variety of others so amusing as to bring laughter to every visitor.

Plenty of activity here. Look closely and you'll find everything from a dentist's office to a lady in a bath!





Crayon marks, food stains and grease spots can be wiped off the plastic covering with soap and water



Spot of cement is smeared near each corner of block, which then is pressed into its place on the wall

Plastic Panels Cover Wall of Any Type

ATTRACTIVE BLOCKS, made of insulating board covered with sheet plastic, can be installed on walls of any type, from plaster to cinder blocks. Each panel is one foot square, has beveled edges and is tongue-and-grooved. The Velon-plastic covering resists abrasion and can be cleaned with a soapy cloth. Only three tools are required to install the blocks—a putty knife, an office stapler and a fiberboard razor knife. A blob of special cement is smeared on each

corner of the block, and the square simply is pressed into place on the wall. Succeeding blocks are slid into place so the tongues and grooves fit together. The interlocking feature allows for expansion or contraction without showing open joints. In corners where a full block is not needed, the fiberboard is cut to fit, and the plastic sheeting cut one inch oversize, then folded around and stapled to the back of the block. The blocks are available in a variety of colors.

When less than a full block is needed, fiberboard is cut to size and the plastic stapled to the back

Succeeding blocks are slipped into place so tongues and grooves fit together, completely sealing joints



the

**POPULAR
MECHANICS**

CRAFTSMAN



Mount the head of your present sewing machine in this beautiful cabinet. See page 193

You'll do a better job of patching plaster after reading the story which begins on page 182





Photo and tile designs courtesy David E. Kennedy, Inc.

TILE

Your Walls and Floors

LIKE THE MAGICIAN who makes a drab stick burst into a beautiful flower right before your eyes, you, too, can make your kitchen or bathroom "burst into bloom" by using modern wall and floor coverings. When their permanency and ease of cleaning are considered, these coverings are relatively inexpensive, especially if you install them yourself. Individual tiles, panel board and flexible wall coverings are available in an endless array

Photo above shows how a gay tile floor can brighten a child's room. Floor-tile designs pictured below are typical of the hundreds of possible combinations

of colors and a variety of designs to suit your tastes and pocketbook. The more common wall coverings include plastic and metal tile, enamel-surface and plastic-type flexible coverings, and predecorated panel board. For floors, which will be discussed next month, there are asphalt, rubber and cork tiles in countless color combinations.

Plastic and metal tile: To estimate the amount of tile required, figure the area in square feet and add five percent for waste. Then measure the amount of trim needed. If you wish to stagger the field tile, as in Fig. 2, remember that a half tile is used to





Roxdale Building Products photo

Above, predecorated panel board in horizontal-line and tile patterns was used to modernize this kitchen

Part I

By Frank N. Stephany

start alternate rows. The only tools needed are a carpenter's level, straightedge, putty knife, trowel having a saw-tooth edge, and a coping saw. A shear-type tile cutter, which frequently can be rented from your tile dealer, will speed the work of cutting.

To prepare the room, remove baseboards, moldings and fixtures. Soak off all wallpaper, remove calcimine and scrape off loose paint. As a smooth wall and strong bond are essential, remove any weak or broken plaster and patch these areas as well as any holes or cracks. All surfaces, whether plaster, wallboard or plywood, should be sealed thoroughly to assure proper adherence of the mastic used to

Walls of kitchen below are completely finished with plastic tile. Harmonizing rubber tile covers floor

Photo courtesy Northwest Wall Tile Co., Inc.





Marsh Wall Products photo

Predecorated panel board produced a striking effect in kitchen and breakfast nook at the left. Photo at right shows pleasing bathroom done in plastic tile



Photo courtesy Jones and Brown, Inc.

bond the tile to the wall. A putty knife, notched in the same way as the trowel will come in handy for applying mastic in narrow areas. Dimensions for cutting the notches are given in Fig. 2.

Before installing the tile, snap a chalk line completely around the room, leveling it along each wall. To locate the height of the line (either for a cap strip or merely as a guide line), measure from the lowest point of the floor or, in a bathroom installation, from the top of the bathtub. This is done to avoid laying small pieces of tile

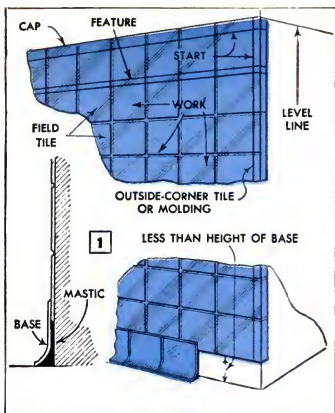
along the top of the tub. If you intend to use individual base tile, locate the level line so the bottom row of tile will extend somewhat below the top of the base tile, Fig. 1, and fill the space between the base and the wall with mastic. If using a strip-type plastic base, carry the field tile to the floor line, trimming the bottom row, and install the base directly over the tile.

The mastic, which should be at room temperature, is mixed thoroughly and applied to the wall in a layer about $\frac{1}{16}$ in. thick, spreading it with the saw-tooth trowel in a

Backing clear-plastic tile with colorful decals has made available many picturelike wall designs of the type illustrated below. Standard $\frac{4}{4}$ -in. tile are used

Photos courtesy Tile-O-Plastic Corp.





sharp, wavy motion. Don't spread the mastic over more wall area than you can cover with tile in about $\frac{1}{2}$ hour.

Except in the case of the interlocking type of tile, which is applied from the bottom of the wall upward, start with the cap strip or with a row of tile at the level line, and then install the outside-corner tiles or molding. Work downward and away from the outside corner, as in Fig. 1. Apply each tile by placing one edge against the adjacent tile. Then snap it into the mastic as in Fig. 2, pressing firmly on the corners, but not on the center. Pointing (making an even line of mastic in the joints between the tiles) is optional. However, this is recommended where the tiled wall is subjected to excessive amounts of water, such as in a shower stall, and can be done with the finger tip, pointing stick or a pencil eraser. Pointing and cleaning off of excess mastic should be done as tiling progresses. Allow the base tile to follow the floor line and carefully seal the top and bottom joints with plenty of mastic.

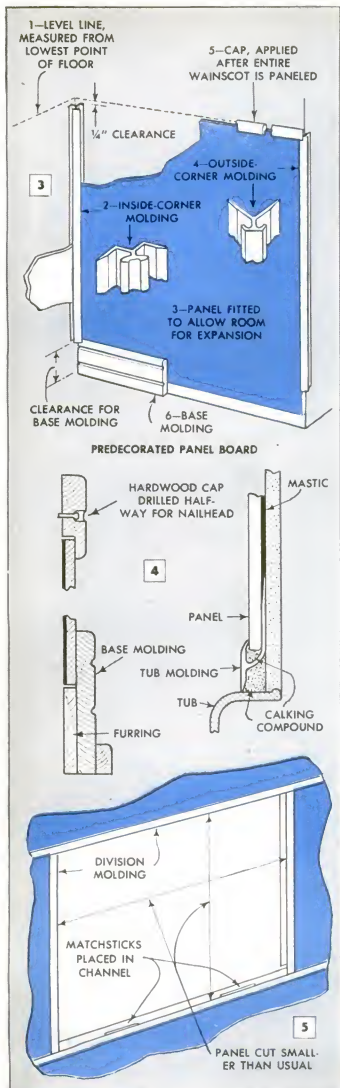
If built-in fixtures are to be installed, cut the openings for them before laying the tile, which then is cut to fit around the openings. Install the fixture after tiling. Drill through the tile and fasten screw-on fixtures directly to the wall—never fasten anything to the tile itself.

For straight cuts use a standard tile cutter, tin snips, or a fine-tooth saw. To fit the tile around pipes or fixtures, cut it with a coping saw. The tile should not be washed or polished for at least 2 weeks after installation in order to give the mastic time to harden thoroughly. Do not attempt to



Tiled bathroom, above, is example of what can be done by including your personal ideas on decoration



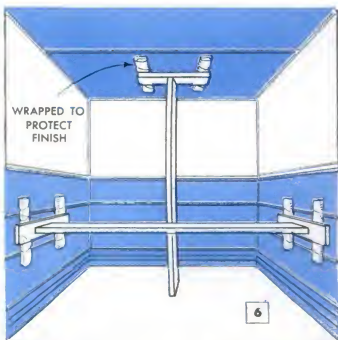


clean the tile with gasoline, acetone, turpentine or any chemical of doubtful effect.

Predecorated panel board: This material is available in panels 4 ft. wide and from 4 to 12 ft. long, and also is applied with a mastic-type adhesive. The board can be obtained in plain colors, scored in tile patterns, or scored horizontally only. It also is available in wood-grain or marble patterns. Moldings to meet every conceivable need can be had in aluminum, hardboard or stainless steel. In basement installations, it is best to dampproof the walls and fur them out before applying panel board. The walls are prepared and sealed in much the same way as for plastic tile. Again, draw a level line around the room and, if a vertical treatment from floor to ceiling is to be used, establish a plumb line.

For a wainscot job utilizing a hardboard cap, as in Fig. 3, allow 1/4-in. clearance below the level line when installing the corner moldings. Also leave clearance at the bottom for the base molding. If the panel is long enough, the outside-corner molding can be attached to the wall and the panel sprung between the moldings. However, if the section of panel is too short to permit springing, slip the outside-corner molding over the edge of the panel and apply the two simultaneously, nailing the exposed flange of the molding. The cap strip and base are fitted after the entire wainscot is paneled. Hardboard cap and base molding are applied as in Fig. 4, the corners being mitered. Note that the hardboard is drilled about halfway through for the heads of the finishing nails to prevent splitting, and that the lower portion of the base molding is reinforced by furring with scraps of panel board or wood. Fig. 4 also details a bathtub installation, using a standard tub molding.

Even though the corners of the room are out of plumb, cut the panel board to fit into

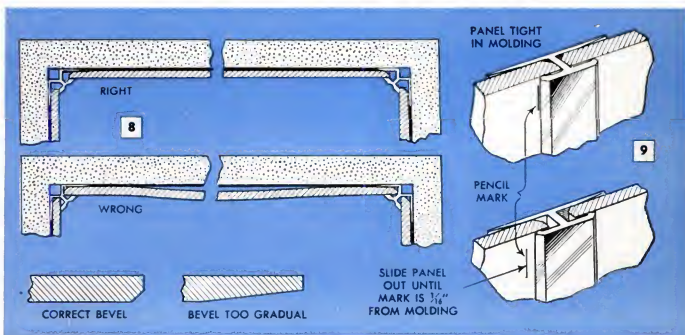
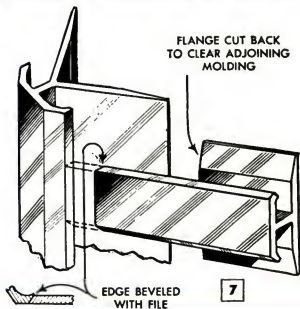


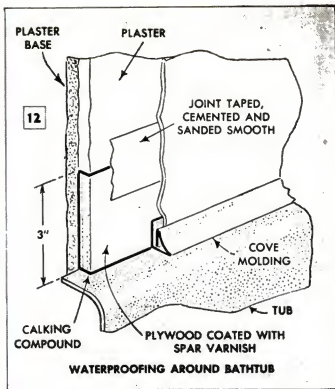
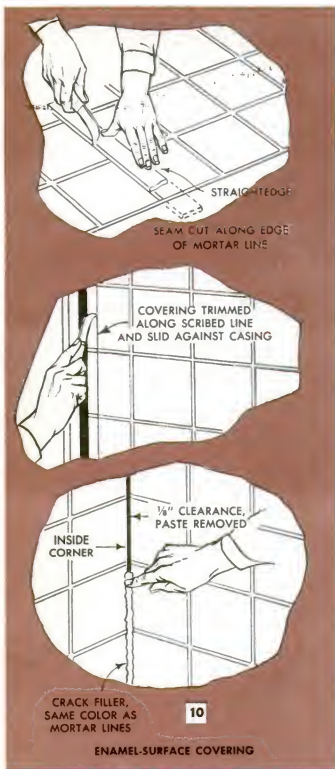


Left-hand photo shows bathroom before modernizing with panel board, photo at right, the transformation

them. The upper detail of Fig. 8 shows the correct way of fitting a panel, allowing a clearance of about $\frac{1}{16}$ in. along each molding. This permits expansion and shifting of the panel without buckling. To be sure that proper clearance is allowed, temporarily fit the panel tightly in the molding and draw a pencil mark on the panel along the edge of the molding, as in Fig. 9. Then, allow $\frac{1}{16}$ in. between the mark and the edge of the molding when installing the panel permanently. Fig. 8 shows how to bevel the back edges of the panels to aid in slipping them into the molding channels.

Apply mastic to the backs of the panels with a notched spreader recommended by

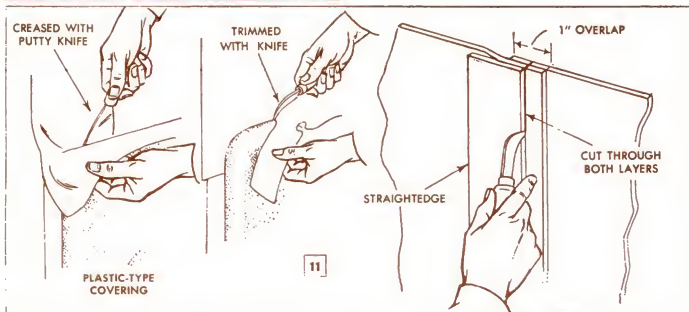




Courtesy Congoleum-Nairn, Inc., and The Tahoe Corp.

the panel manufacturer. Use the level line, not the molding, as a guide when installing the panels. Knead and press the panels against the wall with your hands until you can "feel" the mastic bond. It's a good idea to nail the bottom of the panel to the wall, driving the nails into the studs. Locate the nails so they will be covered by the base molding and do not drive them too tightly, as this is likely to give the panel a wavy appearance. If there is any doubt about the panel holding to the wall, brace it until the mastic sets. The braces can be extended diagonally from floor to wall or across the room, as in Fig. 6. Brace with just enough tension to hold the panels against the wall and protect the panels by wrapping the braces with cloth or paper, as shown.

To panel the entire room, follow the same general procedure, using division molding instead of the cap strip. Nail outer edges of



ceiling panels, covering the nails with cove molding, and prop the panels in place. Fitting horizontal aluminum molding between vertical moldings is done as in Fig. 7.

There's a trick to replacing a panel after the installation has been completed. Cut the panel slightly undersize and place two or more matchsticks in the channel of the lower horizontal molding, Fig. 5. Then, after applying mastic, slip the panel tightly in the channels of the molding at the top and one side so the bottom and opposite side of the panel will clear the face of the molding. Finally, rest the panel on the matchsticks, slide it sideways so all edges engage the moldings and press it against the wall.

Flexible wall coverings: Both the enamel-surface and plastic-type coverings are purchased in roll form. For satisfactory results, they should be applied only to a smooth, dry wall surface and not to walls in direct contact with the ground or weather unless the walls have been furred out. Cracks and breaks in plaster should be patched and sanded, seams of dry walls taped, and all porous surfaces sealed or sized. After the adhesive is applied to the wall, the covering is placed over the adhesive and worked with a wall roller to eliminate air bubbles.

Enamel-surface coverings usually are installed horizontally using a level line as a guide. The joints are butted, with the seams cut prior to hanging as in the upper detail, Fig. 10. Final trimming can be done on the wall as in the center detail. Although metal moldings are available, a neat inside corner can be made, as in the lower detail, by allowing a slight clearance between adjacent sheets and filling the gap with a non-shrinking crack filler tinted to match the mortar lines in the material.

The plastic-type covering is hung vertically, using a plumb line as a guide, and can be formed around both outside and inside corners. For inside corners, the covering should be creased before hanging. The sheets are overlapped and the seams cut on the wall as in the right-hand detail, Fig. 11, the straightedge being necessary to prevent stretching of the material. Because of the resiliency of the plastic-type covering, it can be fitted around fixtures by creasing with a putty knife, as in the left-hand detail, and then trimming with a linoleum knife. A recommended method for insuring a watertight seal around a bathtub is detailed in Fig. 12. Note that a 3-in. strip of waterproof plywood is coated with spar varnish and set in calking compound between the lower edge of the plaster and the tub. The joint between the plywood and plaster is taped and sanded, and cove molding is used around the top of the tub.

(To be continued)

Sanding Block From Chalk Eraser Is Useful on Spindle Turnings



When sanding turnings in a lathe, you will find a blackboard eraser ideal for use as a sanding block. The felt erasing surface provides a resilient backing for the sandpaper. The resiliency of the backing also permits the sandpaper to follow better the contours of the turning. Naturally, a sanding block of this type is suitable only for turnings or portions of turnings that are more or less straight. When sanding irregular portions of a turning, you should use strips of sandpaper or emery cloth that will permit the abrasive to contact the various contours.

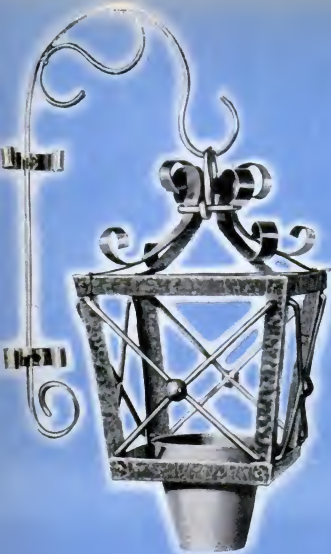
Lubricant Pocket in Screwdriver

To provide a handy reservoir for wax or other lubricant used on screws difficult to drive, drill a blind hole lengthwise in the handle of your screwdriver. Filled with beeswax or paste wax, the hole requires no plug or covering and will keep the lubricant readily at hand when it is needed.



John E. Hyler, Peoria, Ill.

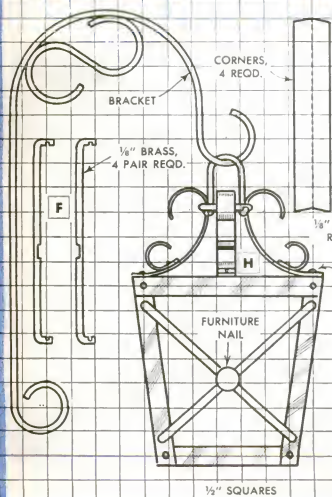
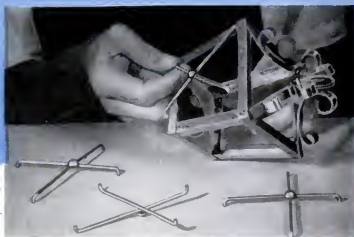
❑ If no blotting paper is available, freshly written ink can be effectively dried with a piece of newspaper or other unsized paper.



Trio in **HAMMERED METAL**

*By Charles and
Bertram Brownold*

Plant Holder



C

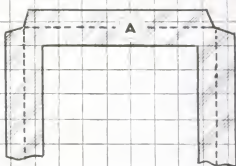


HOOK

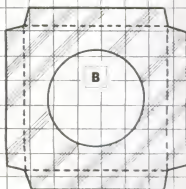


1/8" BRASS
RING

RIVET



BRACKET CLAMP,
2 REQD.

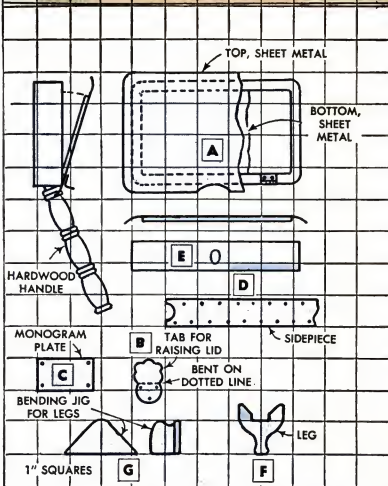


1/2" SQUARES

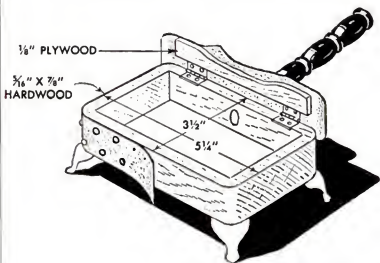
CONSIDERING the original investment in time and money, there are few crafts that offer finished products of more value and beauty than items made from hammered sheet metal. The plant holder pictured on the opposite page takes its lines from the old-fashioned carriage lamp, and is exceptionally attractive when made of brass. The silent-butler cigarette box, below, and the combination coaster rack and napkin holder on the next page are ideal in either aluminum, copper or brass.

None of the three projects requires a considerable amount of sheet metal, and the gauge used is not important—just so it is heavy enough to withstand normal usage. Chances are you'll have enough material in the shop scrap pile for at least one of the projects. But, if you have none of the softer metals and are unable to purchase them for the time being, substitute light-gauge sheet steel and paint the completed project in lively colors.

Plant holder: All parts of the plant holder are riveted together and should be hammered before they are cut out to prevent distortion. The hole in the bottom piece, B, is cut just large enough so the rim of a flowerpot will rest on the edge. At the top



Wooden frame can be jigsawed from block or made by gluing four pieces together. End of handle is tenoned and slotted, and then glued in hole drilled at angle through frame. Wooden wedge is driven in slot to spread tenon and after glue dries, projecting end of tenon is cut and sanded flush with frame



Cigarette Box





Coaster Rack

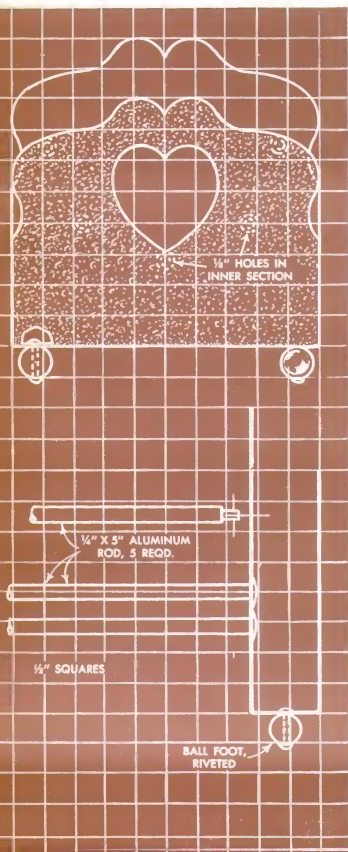


End members of coaster rack are clamped between two pieces of hardwood for bending with wooden mallet. Second right-angle bend is not made until ends of $\frac{1}{4}$ -in. rods have been fastened to sheet metal

of the holder, the ornamental parts, H, are inserted through the brass ring, E, during assembly. The crossed pieces of brass wire, F, which form the sides of the holder, are half-lapped and joined at the center with a furniture-upholstery nail. The latter is driven through both wires and peened over. The notched ends of the wires are inserted through holes drilled in the corner pieces, A, so the notches engage the edges of the metal. Sheet-metal clamps, G, hold the graceful wire bracket to the wall, the vertical length of wire being bent slightly to keep it from slipping. A U-shaped hook, D, is hung from the upper end of the bracket and engages the brass ring.

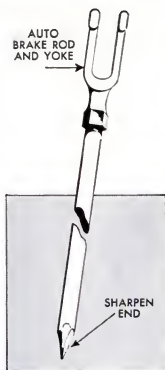
Cigarette box: In this project, hammered sheet metal covers a wooden frame which is fitted with a turned hardwood handle. The squared pattern details the necessary parts. The sheet-metal sidepiece, D, is fastened to the sides of the frame, E, with escutcheon pins, and a sheet-metal bottom piece is nailed to the underside of the frame. Four sheet-metal legs, F, are formed over a wooden bending jig made as in detail G. A piece of $\frac{1}{8}$ -in. plywood is riveted to the underside of the top, A, to serve as a stiffener, and the top is hinged to the frame. The monogram plate, C, the finger tab, B, and the hinges are riveted to the top.

Coaster rack: The ends of the rack, which serve as napkin holders, are jigsawed from sheet metal and joined with five lengths of $\frac{1}{4}$ -in. rod to form a trough for storing coasters or ash trays. The end members are drilled to take $\frac{1}{8}$ -in. tenons filed on the ends of the rods. The rods can be tenoned quickly by chucking them, one at a time, in a drill press and supporting the lower end in a vertical half-round groove cut in a hardwood block, the groove having a $\frac{1}{8}$ -in. radius. The block is nailed to a board which is clamped to the drill-press table. After insertion through the holes in the end members, the tenons are peened over.



An ideal cooking grill that will be easy to carry on picnics can be made from four lengths of car brake rods with yokes and a discarded grate from a stove oven. All that is necessary is to cut the rods to the desired lengths and file or grind the ends to points so they can be pushed into the ground easily to serve as legs. In use, the grate is placed in the yokes as shown. If desired, it can be attached permanently by inserting a cotter pin in each yoke. When not in use, the legs can be folded against the grate for storing. A large rubber band cut from an inner tube will hold them in place.—Roland Cueva, Los Angeles, Calif.

Inexpensive Picnic Grill Can Be Folded Flat To Take Minimum Storage Space in Car

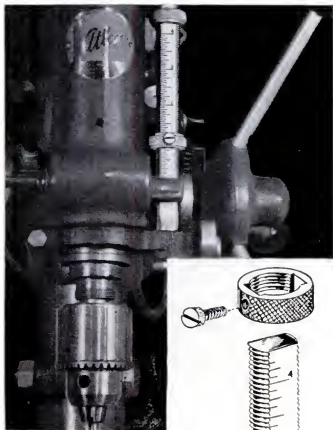


Auto Tires "Sounded" for Tread Separation by Tapping While Suspended

The job of checking tires for loose treads can be done in a few minutes, and the only equipment needed is a bumper jack and a short length of iron rod, pipe, or even a hammer. First, be sure that the tires are not overinflated. Then, with a wheel jacked up, use the pipe to tap on the shoul-

ders of the tire about every eight inches, and listen for "hollow" sounds. Such sounds will indicate a separation, either of the tread and cord, or the plies. If there is any doubt about the sound, let out approximately 10 pounds of pressure and test the tire again.—Ed Packer, Chicago.

Altering Depth-Stop Nut on Drill Press Makes It Quicker Acting



To make a quick-acting depth stop for his drill press, one home craftsman filed grooves on the inside of one of the stop nuts to align with the threaded sides of the gauge rod. This permitted sliding the nut on the rod by holding the grooves in position to pass over the threads, but did not interfere with engaging the threads by giving the nut a quarter turn. A depth could then be set as desired within $\frac{1}{32}$ in. Note that the stop nut is drilled and tapped to take a setscrew, which is used to lock the nut when set at the desired height.

Harrison Neustadt, New York City.

Shellac Preserves Chrome Metal

By cleaning the chrome on your auto and then applying a thin coat of white shellac, the chrome will stay bright and clean and will be protected against rust and corrosion. Chrome-plated surfaces such as bumpers and hub caps, which are exposed to the weather, should be shellacked when the car is new and at intervals of about every six weeks thereafter.

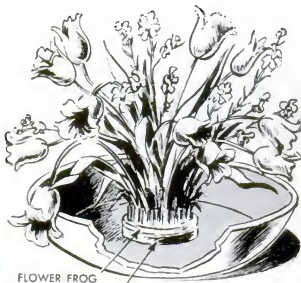
Solving HOME PROBLEMS



NO NEED FOR SINGED HANDS when roasting wieners over an open fire. Take along a few extra paper plates and impale them on the roasting forks or sticks. They serve as wonderful shields to protect the hand from the heat of a hot fire. Being of paper, however, it must be remembered that the plates will burn if held too close to the fire.



DISCARDED COFFEE PERCOLATOR takes on new duties as a string holder. Simply place the ball of string on the percolator shaft and thread it through a hole in the pouring spout. When brightly painted and topped off with a decal, the pot adds a decorator's touch to a modern kitchen. A small notch in the spout holds the end of the string.



MODELING CLAY IS EXCELLENT for anchoring the flower frog of a floral centerpiece. Applied to the bottom of the frog before it is pressed in the center of the bowl, the clay, being waterproof adheres with sufficient strength to keep a large flower spray from tipping over.

FLIES AND OTHER INSECTS dislike the odor of moth crystals and will stay away from any garbage pail that contains a trace of the repellent. In the case of a step-on pail on an open porch, placing a handful of crystals in the pail before lining it is especially desirable.



POPULAR MECHANICS



MARKING OF WINDOWS by Halloween pranksters can be discouraged by coating exposed panes with light machine oil. Wax crayon, candle or soap will not "take" on the oil surface and the oil film can be wiped off later with soap and hot water



DISPOSING OF DUST from a floor mop will not bring on the wrath of neighbors, especially if you live in an apartment, if the mop is cleaned with the vacuum sweeper. Simply lay the mop on the floor and pass the nozzle of the vacuum over it



OCTOBER 1951



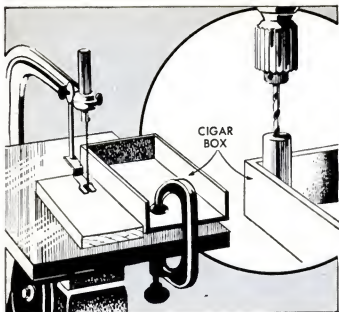
HOT-PAN HOLDER improvised from a section of rubber garden hose stays put on the handle and is interchangeable from one pan to another. Split lengthwise with a sharp knife, the rubber hose grips the handle securely, but is easily pulled off



SCRUB BRUSH WON'T SLIP from your hand and will be less tiring to use if a drawer knob is fitted to the wooden back. The knob provides a projection which is grasped between fingers

BEFORE WEARING A NEW PAIR OF SHOES, coat the edges of the soles and heels with clear fingernail polish. This helps retain the original finish, prolonging the "new look" of the shoes





Cigar Box Provides Ripping Fence For Jig or Band Saw

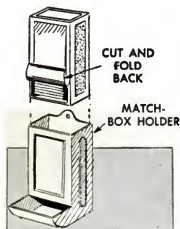
Clamped to the table of a jigsaw or band-saw as shown, a cigar box provides a handy ripping fence that takes almost no time to prepare. Also, the box is handy for holding short pieces in a vertical position for end drilling as indicated in the circular detail. If the box has a tendency to slip on the table when only one clamp is used, glue a few strips of emery cloth, abrasive side down, to the underside of the box.

G. E. Hendrickson, Argyle, Wis.

Matches Kept Straight in Holder by Flap Folded on Box Cover

Instead of removing the cover from a box of kitchen matches before inserting them in a holder, make a flap at one end of the cover by slitting it along the edges and folding it back as pictured. When the cover is slipped into the tray

of the holder with the flap back, the matches cannot feed into the tray too fast, which usually results in their falling at different angles and thus becoming wedged together and difficult to remove. — Albert Zanelli, Wyckoff, N. J.



Pocket-Type Pencil Sharpener Mounted as Stationary Unit

Mounted on the wall near the telephone, on the inside of a desk drawer or on the workbench in the shop, an ordinary pocket-type pencil sharpener is always at hand when needed. Shavings are caught in a small tin can, or in the lid from a 35-mm. film case, as illustrated. This is attached under the sharpener with a thumbtack and can be emptied by tilting to one side. A metal window-shade bracket, having the narrow part bent at a right angle, supports the sharpener. To assemble the unit, drill a small hole through the sharpener and bolt it to the bent portion of the bracket. The latter is, in turn, screwed securely to the wall.

John J. Rea, Urbana, Ill.



How to Find and Overcome Fire Hazards Aboard Power Craft

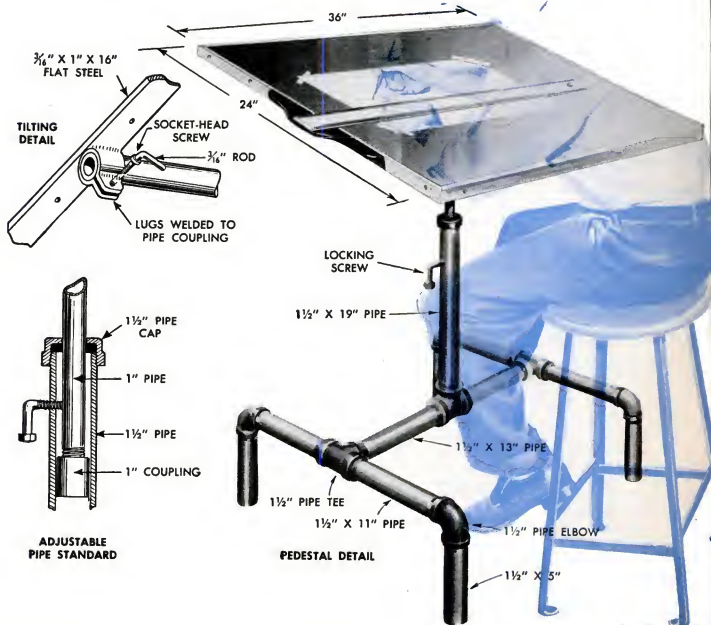
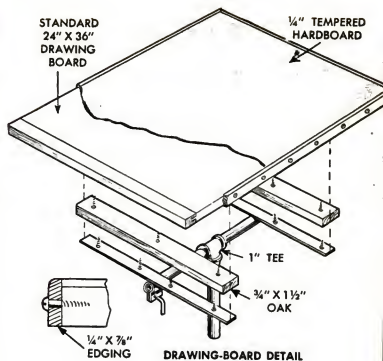
Many fires aboard small craft are caused by fuel vapors coming in contact with overheated exhaust pipes, sparks from the engine or from defective wiring. So check your boat for proper exhaust-pipe insulation, tight fuel and ventilation connections and defects in wiring. Make sure that all wires are of ample capacity to carry the loads imposed, and that the insulation is tough and resilient. To prevent the accumulation of fuel vapors, check fill pipes to see that they are firmly attached to a tight deck plate. Remember that fuel tanks should be properly vented and the screened vent pipes should discharge into open air, away from hull openings, hatches, doors or ports. *They must not discharge into bilges.* Galley ranges, hot-water heaters and cabin heaters are frequent fire-starters. Check

the area of fuel storage for an accumulation of volatile gases and see that fuel-line connections are tight and drip-free. Make a regular inspection to see that galley ranges are free of grease that could ignite. Unclean bilges present a most dangerous fire hazard. Fuel drippings become one danger. Another is fuel vapor, which, being heavier than air, tends to settle in bilges. Overcome the first hazard by successive "pumpings" of the bilge, using cleaning agents specially produced for the purpose. The second danger can be eliminated by ventilation similar to that described for engine compartments. Do not keep fuel-soaked or paint-saturated clothes aboard. If you have a large boat, installing a built-in carbon-dioxide extinguishing system for its engine compartment will provide effective protection.

SHOP DRAWING BOARD

FEATURING a husky, adjustable pedestal assembled from pipe and fittings, this homemade drawing board has the necessary sturdiness to make it ideal for general layout work in the shop. Utilizing a standard 24x36-in. drawing board which is attached to a split-coupling tilting mechanism, the large top may be conveniently locked at any desired angle by two L-bolts. The sectional detail below shows how the 1-in. pipe that supports the drawing board is fitted with a coupling to slide inside the pedestal. It may be necessary to file or machine the coupling to provide a smooth sliding fit. A pipe cap fitted to the top of the pedestal is used to center the pipe in the column. The friction tilting arrangement consists of two split couplings welded to lengths of flat steel. Lugs are welded to each coupling and then drilled for a locking bolt. The latter is made by brazing a $\frac{3}{16}$ -in. rod in the end of a socket-head setscrew, and only one leg of each lug is tapped for the locking bolt. The top of the board may be covered with a panel of hardboard.

R. Barsamian, Skokie, Ill.



How to Patch PLASTER

Minor wall repairs and plastering jobs. Where and how to use Spackling putty, patching plaster and regular prepared plaster

By E. R. Haan



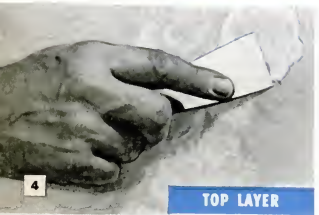
1 UNDERCUTTING



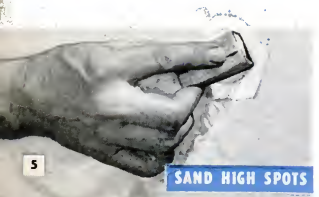
2 WETTING



3 BOTTOM LAYER



4 TOP LAYER

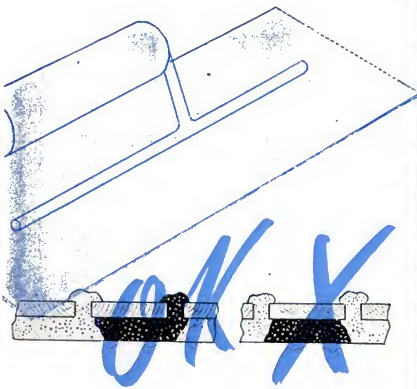


5 SAND HIGH SPOTS

IT'S NO JOB at all to make minor plaster repairs such as filling cracks, "spotting" nail holes and sealing spaces between wood trim and plaster. Equally important is the occasional job of replacing loose plaster, especially in older houses. The time to make these repairs is just before repainting or wallpapering. Many remodeling jobs also require some plastering, which the average homeowner can tackle. However, major replastering jobs such as entire walls and ceilings call for the skill and experience of a professional plasterer.

Where to use Spackling putty: You use Spackling putty to fill cracks in plaster, from hairline size up to about $\frac{1}{8}$ in. wide; in nail and screw holes around which plaster has not broken away; for nicks and surface imperfections in plaster, and for cracks that have developed between wood trim and plaster. To use the putty, first remove grease with strong washing solution and clean off all loose paint and dirt particles. A putty knife or wide scraper is handy for applying it and to smooth it on flat surfaces. At corners you can use a spear-shaped window-glazing tool, or just your finger protected with a rubber finger cot. Wipe off excess putty and smooth down the filling with a wet sponge.

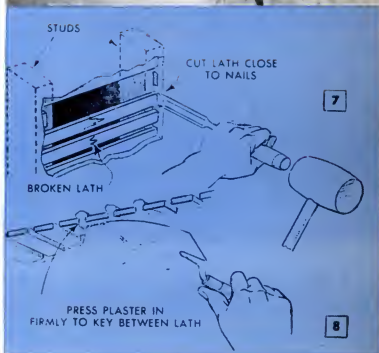
Patching plaster: For cracks over $\frac{1}{8}$ in. wide, and for areas up to about a foot or so square, use patching plaster. The powder is prepared by adding water and mixing to a smooth paste. Don't mix more than you can use before it starts to set—from 10 to 30 minutes depending on the product. Setting can be retarded by adding an equal amount of vinegar to the water used for mixing. Undercut the edges of cracks and small patches to make them wider at the bottom than at the top as in Fig. 1. This anchors the plaster in place. Next, brush away all loose particles and soak the old plaster, and plaster base if exposed, with water, Fig. 2, using a brush and taking care to avoid



runs that may stain wallpaper. Wetting prevents rapid absorption of moisture from the patching plaster, which causes it to dry out too fast and crack away at the joints.

Press the plaster firmly against the under edges with the putty knife, Fig. 3. If the hole goes down to the lath, press the plaster down to key with the lath. Fill the hole, or wide crack, to $\frac{1}{8}$ in. below the surrounding surface. If the hole is filled flush in one application, shrinkage of some kinds of patching plaster may cause a dish-shaped depression. Let the first application dry overnight, then wet the surface and complete the job, Fig. 4. If a nonshrinking type of plaster is used, fill the hole in one application. If the patch is too high when dry, dress it down with a coarse file (handle removed) or with sandpaper wrapped around a small block, Fig. 5. Seal the patch with thin shellac and allow this to dry before painting to prevent its showing up as a dull spot. If the adjoining wall surface has a sand-float finish, make the patch finish similar by adding an equal amount of clean, sharp sand to the last application, and pounce it with a piece of pile carpeting wrapped around a block.

Larger patches: When plaster bulges, particularly on ceilings where wood lath is used, and especially if it has been subjected to repeated soaking, chances are that it has loosened from the lath and is likely to fall off. Then the only remedy is removal of all loose plaster as in Fig. 6. Old plaster keys between the laths are pushed through, out of the way, so that the new plaster can key securely. Make the edges



of solid plaster as regular in shape as possible—without jagged edges.

Sometimes the laths are loose; if so, nail them down solidly to joists or studs with lathing nails. If a lath has been pulled off, replace it. Broken laths are more likely to occur in walls crushed by heavy impact. In such cases the plaster is removed back to a stud on either side of the break and the broken pieces of lath are cut off midway on the studs with a chisel and mallet as in Fig. 7. This provides space to nail on new pieces of lath. Spacing between wood lath



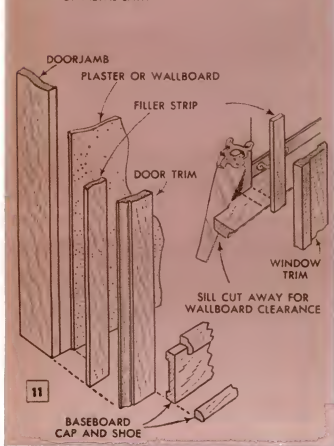
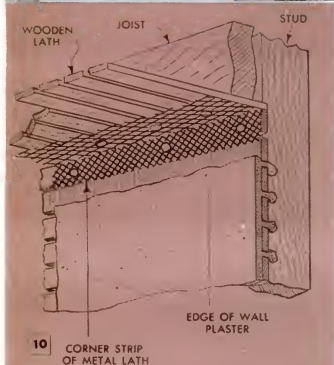
should be about $\frac{1}{4}$ in. If desired, you can use a piece of metal lath instead of wood lath, cutting it with tin snips and attaching it with $\frac{3}{4}$ -in. staples.

Before patching, brush away all loose particles from the edges of the old plaster. Then wet the lath and plaster edges thoroughly. A pointing trowel or regular plasterer's trowel is more convenient to use in filling intermediate-size patches than a putty knife. A single, thick layer of patching plaster over lath, particularly on ceilings, often tends to sag. Therefore, after wetting the plaster edges and lath thoroughly, start by applying a layer to just cover the lath, pressing it down firmly to key it properly as in Figs. 8 and 9. After this has set, add more to build up the thickness until it comes $\frac{1}{8}$ in. below adjoining plaster. Allow the plaster to dry overnight, then wet the surface and fill flush with a vinegar-retarded mixture so that you will have time to finish the surface properly. To match a smooth adjoining surface, use a trowel. To match a sand-float finish, add an equal amount of sand to the last batch of plaster and use a wooden float, Fig. 22, to even the surface. To get a surface level, check with a straight-edge placed across the patch. While the filling is still soft, surplus plaster can be scraped off with the straightedge or with a wide metal scraper, moving it back and forth with a sawing motion while pushing it ahead. If adjoining surface is textured, allow the patch to dry, then apply texture paint as described under heading, "Covering unsightly walls."

For patches larger than a foot or so square, it's easier and more economical to use regular prepared plaster, application of which is covered under the headings, "Base-coat plaster" and "Finish coat."

Using trowel or float: When using a trowel or float for smoothing plaster, move it sideways, lifting the forward edge a trifle so it rides over the surface to avoid cutting into it. Keep the working surface of a trowel or float clean and smooth. When the finish surface starts to set, it can be troweled smooth and glossy by wetting the trowel a little, or running a wet brush ahead of the trowel as in Fig. 24. The float also should be dipped in water as necessary so that it won't adhere to and drag out soft plaster.

Covering unsightly walls: Old walls and ceilings that show many scars of previous patching jobs improperly done, may be restored to excellent appearance by covering with texture paint, provided the old plaster is securely attached to the lath. Texture paints, available in many tints, are of heavy consistency to permit filling low spots to produce a uniform surface. This may be pleasingly textured with brush marks, swirls, mottling with sponge or crumpled



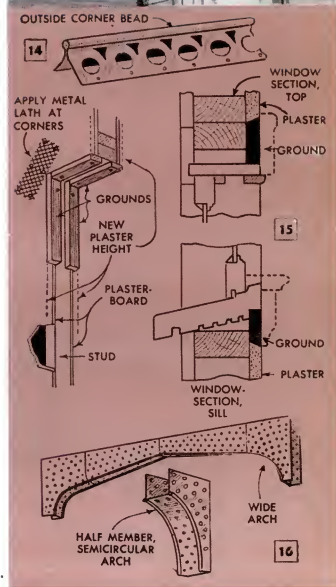
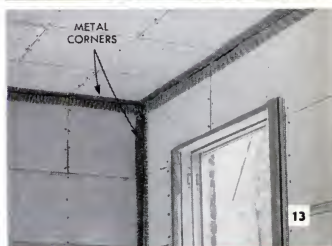
paper, or it can be stippled with a brush.

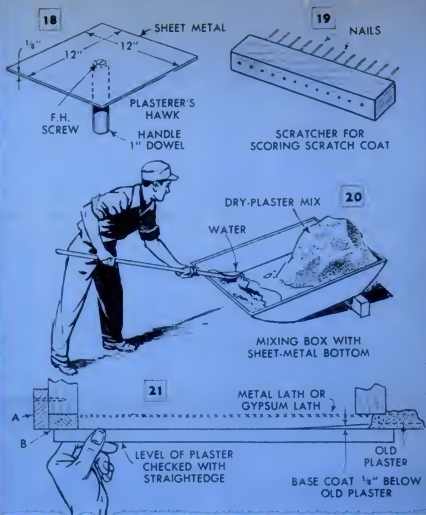
Replacing walls and ceilings: When loose plaster extends over large areas, it is probable that the entire wall or ceiling must be renewed for safety as well as for appearance. For a complete replastering job all old plaster must be removed; that between the laths is raked out or pushed back so spaces are open. If only a ceiling is replaced, a 2 or 3-in. strip of plaster is removed also from the top edge of walls as in Fig. 10. Strips of metal lath or ready-made corner strips are installed in corners to prevent cracks. The strips are fastened to studs and joists with large-head nails or long staples, spaced 6 in. where possible. You can do all this preparatory work and have a professional plasterer finish the job.

An unsightly ceiling, still tightly attached to the lath, can be covered with a new plastered ceiling if the supporting framework is strong enough to bear the added weight. Here, a plaster base of metal lath over furring strips, or self-furring metal lath, is installed, using washers and nails which are long enough to enter the joists about 1½ in. The nails should be spaced about 6 in. apart. Bend the lath to overlap walls where a narrow strip of plaster is removed, Fig. 10. Covering walls in this manner involves removing all trim and installing filler strips to bring door and window casings flush with the new plaster, Fig. 11. Considering this added work and expense, it may be better generally to remove the old plaster. In many cases, however, you can substitute ½-in. hardboard or ¼-in. wallboard for plaster, although this, too, requires the removal of trim and the addition of filler strips, Fig. 11.

Plaster bases: Either metal lath or gypsum lath is used for supporting plaster. Metal lath comes in sheets approximately 27 in. wide and 96 in. long. On large wall areas the sheets are run horizontally, the ends overlapped 1 in. and the edges about ½ in. Horizontal edges are held together with galvanized tie wire midway between studs. The sheets also are staggered so that the ends come on different studs or joists. Metal lath is nailed or stapled to these supports every 6 in., and is bent to fit inside and outside corners, running it past them to the next support to prevent corner cracks from developing.

Gypsum lath, Fig. 12, comes in 16 x 48-in. sheets, ⅜ and ½ in. thick. Some types are perforated to give a mechanical key besides the natural bond by suction. The sheets are nailed directly to studs and joists, or furring strips, with 1½-in. standard blued lath nails spaced 5 in. apart. For certain types of "floating" assembly, the lath is held by metal clips attached to studs and joists. Sheets are placed horizontally,





face side out, and are staggered so that the ends will come midway on different nailing supports. Gypsum lath should be used only as a base for gypsum plaster; lime plaster and cement plaster do not bond with it adequately. When using gypsum lath, the corners where two walls meet, or those where walls and ceiling join, are reinforced with special corner covering or prebent strips of metal lath, Fig. 13. Reinforcing strips are provided also over the upper corners of doors and windows, as in Fig. 15, to prevent cracks.

Corner bead, grounds, metal arches: For outside corners over any type of plaster base, you use corner bead, Fig. 14. This protects the plaster against blows and also provides a "ground" to which plaster comes flush. It must be attached carefully so that the corner will come exactly to plaster height of both adjoining walls.

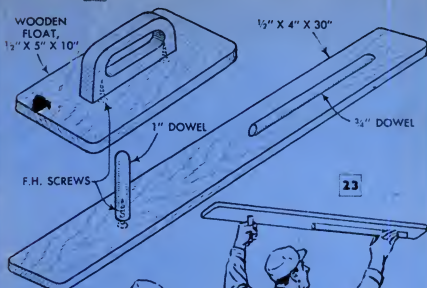
Grounds at door openings which are cut through an existing wall or partition are installed as in Fig. 15 and later removed. The detail also shows how permanent grounds are placed along window casings. Permanent grounds also are nailed across studs to come just below the top edge of baseboards. Sometimes an additional one is installed at floor level. In many remodeling jobs, the old wall to which plaster is joined serves as a ground, and the other grounds are adjusted to this height. The edges of old plaster should be cut off as regular as possible—not jagged—in order to

make the joint as inconspicuous as possible.

Where arches are desired, ready-made ones of perforated metal, Fig. 16, can be purchased in various sizes. Rounded corner pieces alone eliminate the difficult job of making symmetrically curved frame pieces and provide a good plaster base.

Ready-mixed plaster: It is not necessary or advisable for you to prepare and mix plaster ingredients. Prepared plaster is available in which the right ingredients are exactly proportioned by manufacturers, requiring only the addition of water. In all cases the manufacturer's instructions on the package should be followed carefully. Gypsum plaster should not be used on the exposed outdoor walls, on concrete or on asphalt coatings, or on walls subjected to excessive moisture. But it can be applied to clean brick or building tile.

Base-coat plaster: The standard minimum thickness of plaster for new construction is $\frac{5}{8}$ in. over metal lath and $\frac{1}{2}$ in. over all other lath. However, in remodeling jobs, the new plaster should come flush with the old plaster to which it is joined. Plaster is applied in separate coats—one coat of base plaster over gypsum lath but two over metal lath, followed by a finish coat in each case. Use either wood-fiber or sanded base-coat plaster. Occasionally, in a remodeling job where the wall is to be painted or papered, the finish coat may be omitted and the base coat brought flush with old plaster and troweled smooth.



LONG FLOAT, OR DARBY, FOR LEVELING LARGE AREAS OF PLASTER



WHEN SMOOTHING FINISH COAT, APPLY WATER WITH BRUSH



Mixing plaster is easily done in a watertight box having sloping ends, Fig. 20. By tilting it at one end where the dry plaster is piled, you can mix quantities as needed at the other end. Use a hoe for mixing large batches and a garden trowel for small ones. Mix only as much plaster as you can use in an hour. Don't add water after the plaster has started to set, and don't mix plaster of a previous batch with a fresh batch. Put some on a hawk, Fig. 18, to hold in the left hand, and apply it with a plasterer's trowel.

When applying plaster to lath, press the first, or scratch, coat down sufficiently to work it through the spaces of the wood lath, or mesh of metal lath, to obtain good keying, or to form good bond to gypsum lath. Then, cover the lath about $\frac{1}{4}$ in. Score crisscross grooves about $\frac{1}{8}$ in. deep while the plaster is soft, using an improvised scratcher, Fig. 19, or a piece of metal lath. After the first coat has set hard, apply a second coat as in Fig. 17, to come flush with the ground. Where the new plaster joins old plaster, the edges must be soaked with water thoroughly to prevent rapid absorption of moisture from the new plaster. Soaking the edges of the old plaster can be done either with a sponge or a brush. Soak the plaster and lath just prior to patching.

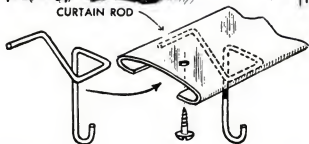
Although you do not make allowance for thickness of the finish coat when preparing grounds, it's best to keep the base coat $\frac{1}{8}$ in. below the surface of old plaster

where it joins, Fig. 21. Run the corner of the trowel—or use a pointing trowel—along the old plaster edge, and then “wipe” the plaster with a trowel back slightly, returning gradually to the plaster height of other grounds. This need not be done if a finish coat is not required. To get plaster level, use a straightedge across the grounds as in Fig. 21 (called “rodding” in plasterer's jargon). For good adherence of a finish coat, the surface of the base coat should be slightly roughened by using a float, Fig. 22. A long float—“darby”—having two handles, Fig. 23, is convenient for large areas.

Finish coat: You can also buy prepared finishing plaster, requiring only the addition of water. There are two kinds: smooth, trowel finish, and sand-float finish for use with steel trowel or float respectively. The base-coat plaster must be hard when the finish coat is applied. If dried out, moisten the surface with a wet brush but do not soak. Finish plaster is “skimmed” on in two applications, Fig. 25, producing a coat from $\frac{1}{16}$ to $\frac{1}{8}$ in. thick. As soon as the first application has set enough to prevent its wrinkling, skim on the second. When the plaster starts to set, you can give it a final troweling for a smooth, glossy finish, using a clean wet brush ahead of the trowel, Fig. 24, but use water sparingly. For an extra-hard surface, use Keene's cement in the proportion of 25 lbs. of dry, hydrated lime to 100 lbs. of Keene's cement.

(Some photos courtesy United States Gypsum Co.)

Adjustable Cup Rack Saves Space On Cupboard Shelves



Instead of driving small screw hooks into the underside of a cupboard shelf to hang cups, use an adjustable rack of the type shown. It permits the cups to be spaced to accommodate tall dishes, pitchers, etc. The rack consists of a length of channel tubing taken from an old telescoping curtain rod. Hooks bent to the shape shown from fairly heavy wire hold the cups and slide in the channel, which is screwed to the shelf.

William B. Eagan, Louisville, Ky.

Photo Frame Holds Copy Papers



Artists and typists, as well as craftsmen, will find an 'easel-type' photo frame handy for holding artwork, written material or blueprints in positions where they can be seen easily. Fasten the material to the frame with a spring-type paper clip, as shown, or with a rubber band.

Stencils Made With Screen Wire

Name and number stencils, suitable for rough work where large letters and numbers are used, are easily made from small squares of 16-mesh screen. Outline the

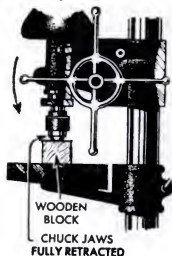
letter or number desired on each square and then fill the mesh outside the lines with asphaltum varnish or liquid glue. Both the glue and varnish should be of heavy consistency so that the film will fill the mesh when spread and will not break through when drying. Use regular stencil colors and apply with a round stencil brush.

Ken Murray, Colon, Mich.

Head of Drill Press Adjusted By Utilizing Gears on Spindle

Instead of "wrestling" with your drill press to raise the head, you can make the adjustment by using the gear and rack in the spindle. To raise the head, run the spindle all the way up, open the jaws of the chuck and bring the table up as far as possible, placing a block of wood under the chuck as indicated. Then, loosen the locknut on the head and raise the latter by rotating the spindle handle.

Bernard J. Corey, Thorald, Ont., Can.



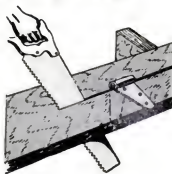
C-Clamp Provides Small-Parts Vise

The problem of holding small parts in various positions in a large vise is solved by first placing the work in a small C-clamp and then locking the clamp in the vise in the desired position. In this way it is possible to hold individual small parts for filing or making accurate measurements, or to hold an assembly of parts in a convenient position for soldering.

Geo. J. Berkwitz, New York City.

Hinge Used for Ripping Wedge

When ripping work and a wedge is needed to prevent it from pinching the saw, try using an ordinary strap hinge. With one leaf of the hinge inserted in the saw cut and the other resting on the face of the work, the hinge won't drop out as the sawing progresses. If a thicker wedge is needed, simply fold the hinge together and insert both leaves in the cut, advancing hinge as sawing progresses.

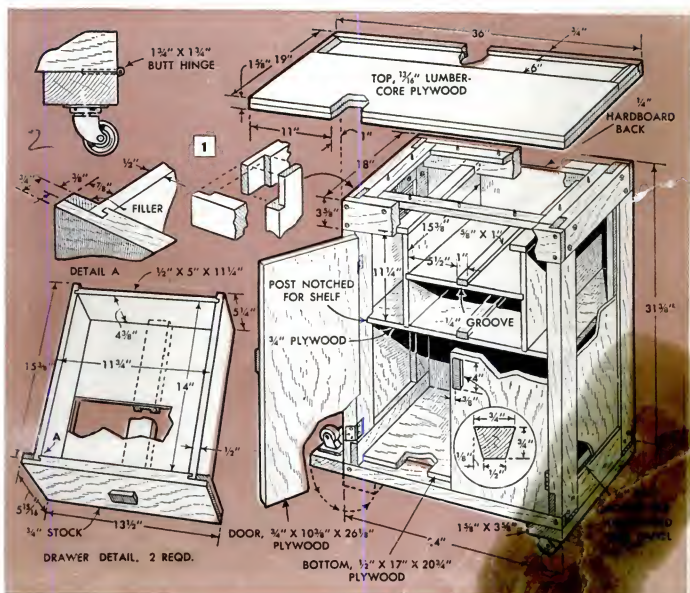


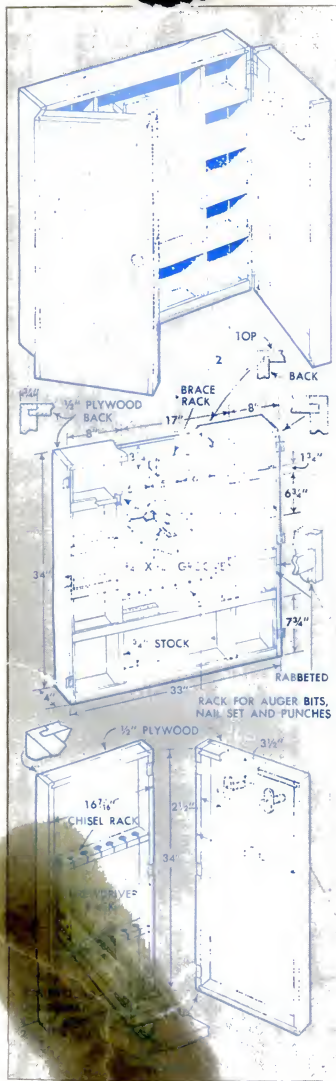
WORKBENCHES and WALL CABINETS

Part II

TO COMPLETE the series of workbenches and wall cabinets which began last month, these pages detail a portable bench, two wall cabinets and a tool panel. Designed especially for the man who sets up shop in an apartment or utility room, the trim, practical workbench features retractable casters. The cabinets and tool panel are intended for use with the larger benches shown in Part I.

The apartment workbench, Fig. 1, consists of a heavy plywood top mounted on a frame of $1\frac{5}{8}$ x $3\frac{5}{8}$ -in. stock. Storage space is provided by two drawers and a $\frac{1}{2}$ -in.-plywood bottom shelf, the contents of the





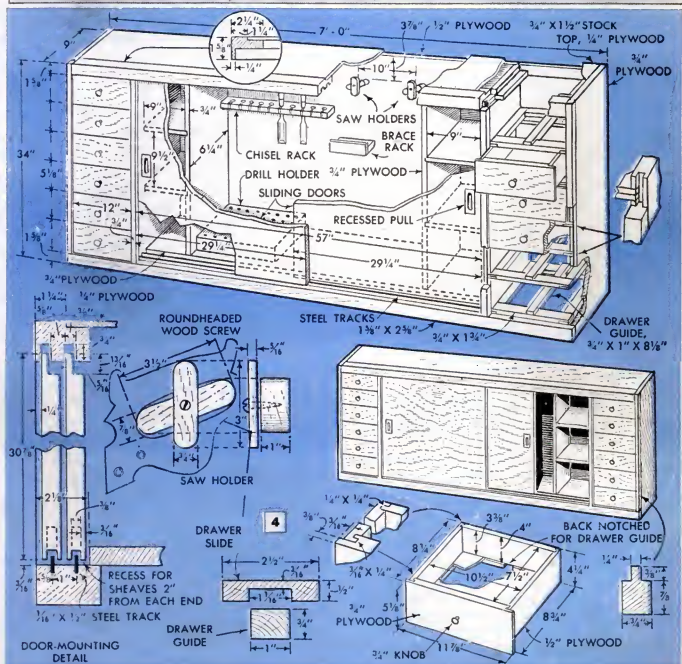
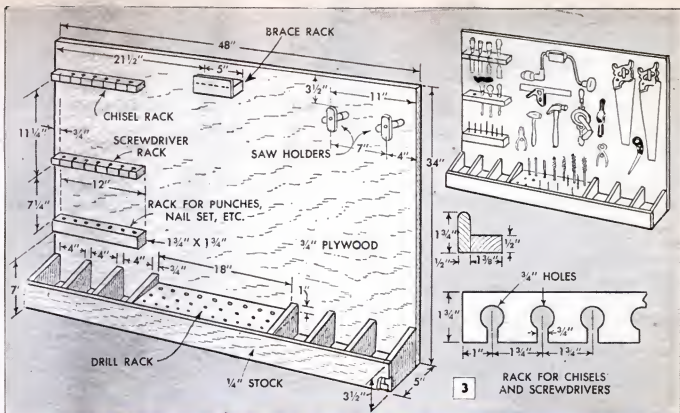
bench being neatly concealed by a pair of plywood doors. The side members of the frame are grooved to take $\frac{1}{4}$ -in.-hardboard panels, but the hardboard back panel is nailed directly over the frame members. Note that the top, which is made up of two layers of plywood, is screwed to four $\frac{3}{4}$ x $1\frac{3}{4}$ -in. cleats mounted on the inside faces of the bench rails. The cleats are half-lapped at the corners to form a frame.

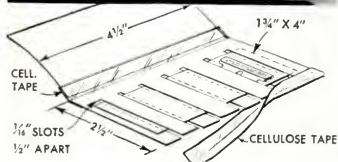
Although the wall cabinet detailed in Fig. 2 is only 33 in. long and 34 in. high, it will store a surprising number of hand tools and small parts. The back of the cabinet and the door fronts are of $\frac{1}{2}$ -in. plywood while frame members and shelves are of $\frac{3}{4}$ -in. solid stock. The sides are grooved for tenons cut on the ends of the top and bottom pieces, and the inside faces of all four frame members are grooved to take $\frac{1}{4}$ -in. tenons cut on the edges of the back panel. The doors are made in the same way as the cabinet except that the door panels overlap the outer edges of the top and bottom members. The sides of the cabinet and the inside shelf partitions are grooved for the edges of the $\frac{3}{4}$ -in. shelves. Note in the center detail that the front edges of the sides are rabbeted and the shelf supports are notched so the $\frac{1}{4}$ x $1\frac{3}{4}$ -in. shelf rails will fit flush. After completion, the cabinet is fitted with tool racks and two turn-button handsaw holders, the latter being detailed in Fig. 4. A pattern for cutting the chisel and screwdriver racks is shown in the lower right-hand detail of Fig. 3, and a cross section of the brace rack is pictured directly above this detail.

Fig. 3 details a handy tool panel made from a 34 x 48-in. sheet of plywood which is fitted with a row of small-parts bins and a drill rack. Note that the end members are rabbeted for the length of $\frac{3}{4}$ -in. stock which forms the bottom of the bins.

The large wall cabinet, Fig. 4, contains 12 storage drawers plus generous shelf space and a tool panel, both the shelves and tool panel being covered by two sliding doors. The back panel of $\frac{1}{2}$ -in. plywood can be stopped at the drawer partitions, if desired, or run the full length of the cabinet. The drawers ride on center guides mounted on half-lapped frames, which are glued in grooves cut in the side panels and inside partitions. The frames are installed before tenoned facing strips are applied over the front edges of the panels. The top rail is grooved for the sliding doors, as in the lower left-hand detail, and notched for the ends of tilt sticks which are fitted directly above the sides of the top drawers. Sheaves inserted in recesses cut in the lower edges of the sliding doors roll on two steel tracks embedded in the bottom rail.

(The end)





Case for Storing Razor Blades Made of Cardboard

Hobbyists, craftsmen and housewives, who keep old safety-razor blades for future use, can store them safely in this case, which holds three blades. If a greater capacity is desired, the case is made longer. Three pieces of cardboard constitute the assembly, two of them being cut $2\frac{1}{2}$ in. wide and $4\frac{1}{2}$ in. long for every three blades to be held. One of these pieces will be used as the cover of the case while a series of $\frac{1}{16}$ -in. slots $\frac{1}{2}$ in. apart are cut in the other, starting $\frac{3}{8}$ in. from one edge and running to the opposite edge as shown in the detail. The third piece of cardboard is $1\frac{3}{4}$ in. wide and $\frac{1}{2}$ in. shorter than the length of the case and is woven between the tabs of the slotted piece. Then a strip of tape is applied to hinge the cover to the slotted piece and another to bind the tabs together.

Improved Test-Tube Holder

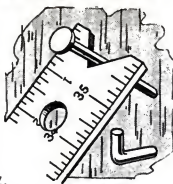


as the base of the holder to which a wire arm, shaped as shown, is attached by inserting it in the cork.

ⒸSome iodine stains will fade out of cloth if held over a hot-air register.

Nail Guides Yardstick Over Hook

If there is a hole near one end of your yardstick for hanging it on a hook, which usually is located well above eye level, use the idea shown to slip it into position easily. Notch the end of the stick next to the hole and then drive a nail directly above the hook. When hanging the stick, push the notched end against the nail, which then will act as a guide to the hook.

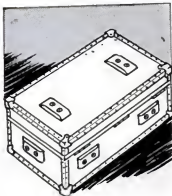


Shellac Used to Fill Cracks

Small cracks in wooden bowls, lamps, book ends or some pieces of furniture, can be filled neatly by pouring shellac into the opening after the surface has been cleaned thoroughly and dried. Shellac sticks, which are heated at the end and applied to cracks by using the stick like a pencil, are available in various shades. For large cracks, use a mixture of fine sawdust and shellac.

Wooden Skids on Luggage Pieces Prevent Damage in Transit

Heavy luggage, such as trunks and foot lockers, can be fitted with skids that will help prevent damage in transportation. The skids for each piece of luggage consist of ten $1 \times 3 \times 6$ -in. hardwood blocks bolted to the sides, ends, top and bottom of the piece as indicated. Use stove bolts and countersink the heads into the blocks. Strips of adhesive tape over the nuts inside the luggage will protect the contents. Before attaching the blocks, the ends should be beveled to give them the skid effect.—S. Augspurger, Chicago.



Salvaging a Worn Pocketknife

After many sharpenings, the width of a blade on some pocketknives is so reduced that the pointed end projects above the handle, where it may wear or cut holes in the pocket or even result in injury to the hand. To repair such a knife, grind down the thick part of the blade where it pivots, reducing the width enough to permit the blade to close deeper into the handle.



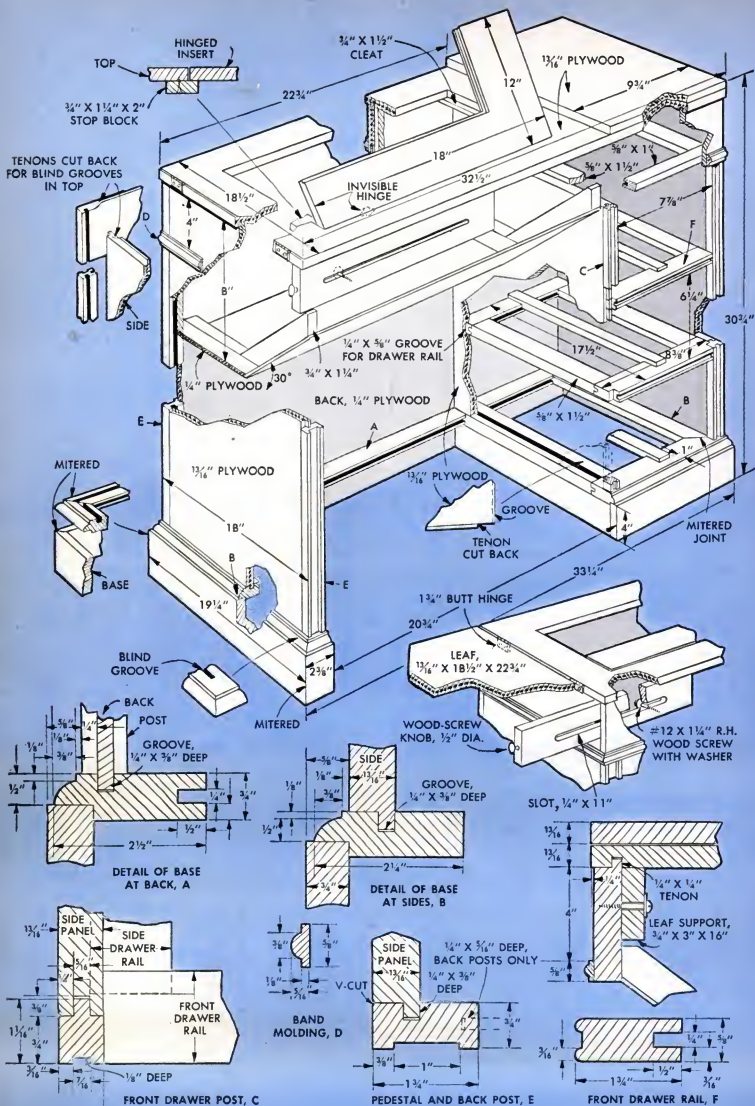
Designed by John Bergen

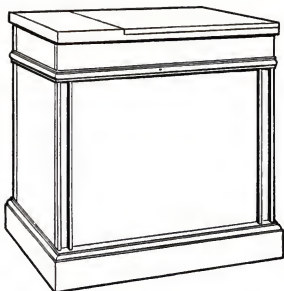
Sewing-Machine Console

WHY PUT UP with the inconveniences of an unsightly electrified treadle or portable sewing machine, or an outmoded console type, when you can so easily modernize any one of them by fitting the sewing head into this fine console? Characteristic design features are carried out in detail both on the front and back of the cabinet. As you will see from the lower left-hand drawing on page 195, the cabinet can be made smaller where space is limited or if the tier of drawers is not desired.

Structurally, the cabinet is designed to make a neat, drumtight job with a minimum of individual joints. Note that the plywood side panels are rabbeted and grooved to take facing strips, or posts, of solid stock. The inner faces of the pedestal and back posts are grooved to fit over long tenons

formed by the rabbets in the side panels. These decorative facings extend from the base frame to the lower edges of the front and back aprons which support the span of the top. The bottom edge of the back apron and the inner edges of the back posts are grooved to house the $\frac{1}{4}$ -in.-plywood back panel. The top edges of the front and back aprons are rabbeted to form long tenons which fit into blind, or stopped, grooves cut in the subframe of the top assembly. Now, before you cut stock for the front and back posts, note that the front drawer posts are only $1\frac{1}{16}$ in. wide, section C, and that a tongue is cut on the back edge of each to form a long tenon fitting into grooves cut in the front edges of the plywood panels. All posts have a shallow groove centered on the front face as a decorative feature. The



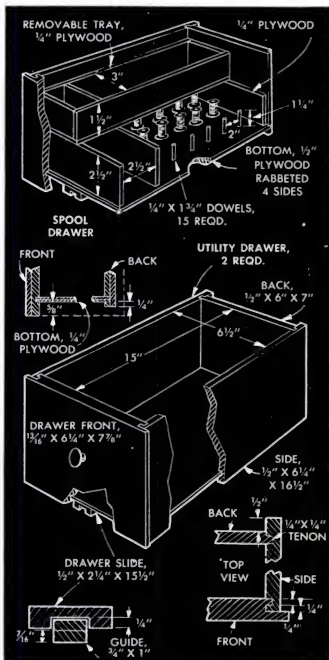
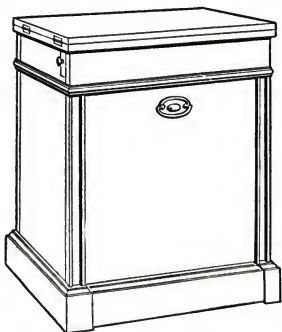


Rear view of console

position and assembly of these parts will be seen from a study of the details, particularly sections A, B, C and E.

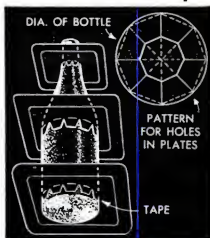
The base is built up by joining two open frames with mitered corners. The best way is to build the frames complete, then cut out one side of each to form the opening for the chair unit. The pieces cut out of the frames can be used later on to complete the design details on the back of the chair. The upper frame is rabbeted all around so that it fits over the top of the lower frame as in details A and B. The outer edges of the upper frame are molded and the top faces of all pieces except the front one, which forms the lower drawer rail, are grooved. Note also that the front and back members of the upper and lower frames are joined by cross members which complete the inner side of the drawer-pedestal base. The upper cross member is tenoned

Small cabinet without drawers



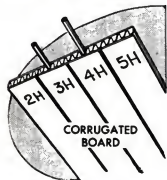
Assembled from three paper plates and an empty beverage bottle, this colorful tidbit server will provide a novel centerpiece for the children's party table. Eight triangular tabs are cut from the center of each plate and folded downward at right angles to form an octagonal opening just large enough to fit around the bottle at the point where the plate will be located. The plates are held in place by taping the tabs to the bottle. Cut off the points of the tabs before taping to prevent them from being seen below the plates. The server can be decorated in several ways. Designs can be painted on the plates with water colors and the bottle filled with a colored liquid to match or har-

Colorful Tidbit Server for Children's Parties Made From Paper Plates and Beverage Bottle



monize. Or, if desired, the entire server can be painted with household enamel and designs added by applying color transfers. As a finishing touch, insert a cork in the bottle and stick a few colored feathers in it.
Helen Lemberger, Chicago.

Corrugated-Cardboard Sheath Stores Pencil Leads

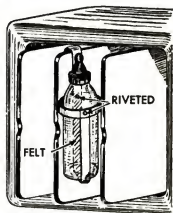


slightly longer than the leads, and allow an inch or so in width for each type of lead to be stored. Mark vertical lines on the front to divide into sections for each type of lead. Remove the leads by pushing them up from the bottom with the pencil point so that they can be grasped with the fingers.

A small, rectangular piece of corrugated cardboard is an ideal container for leads used in refill-type pencils, such as those used for sketching, photo retouching, etc. Cut the cardboard so that the corrugations are

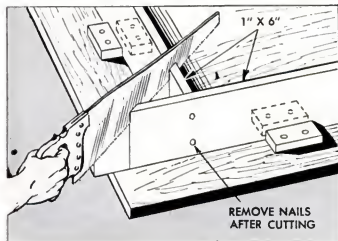
Baby's Formula-Bottle Holder Hooks to Car Heater

Hooked onto a vane of the car heater, this handy holder for the baby's bottle exposes the latter to a continuous blast of warm air to keep the formula ready for immediate use. The holder is made by bending a length of sheet metal into a U-shaped bracket with an extending hook, and riveting it to a sheet-metal ring. Strips of felt are cemented to the inside surfaces of the holder to prevent rattling.



J. Shields, Bloomington, Ill.

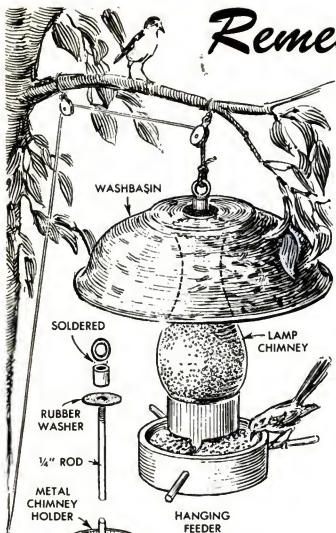
Two Pieces of Work Held in Temporary Jig Are Mitered Simultaneously



In an emergency, long lengths of flat work, such as baseboards, can be mitered by using this simple jig. A table, bench top or a plywood panel, is used as a base to which guide blocks are nailed to hold both pieces of work on edge and at the desired angle. Note that one piece is nailed to the other, and that the miter is cut by sawing both pieces of work at the same time.

Herbert E. Fey, New Braunfels, Tex.

☛ If a little common salt is added to gasoline used for removing spots on thin and delicate materials, the disfiguring ring that is often left can be avoided.

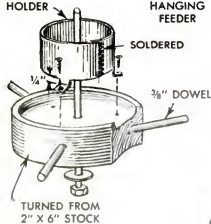


Remember the Birds

By Hi Sibley

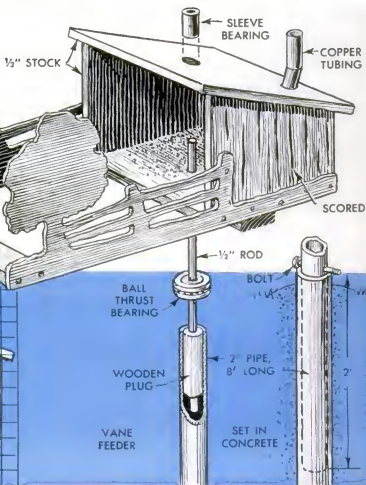
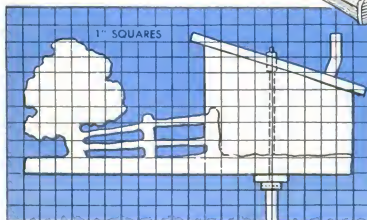
WITH WINTER not too far away in various parts of the country, now is the time to make sure that your feathered friends will not be forgotten when snow and ice make food scarce. By getting an early start in making either one of the two attractive feeders pictured and detailed below, you'll be ready to offer a handout when the snow flies.

The hopper-type feeder shown at the left is built around a washbasin and a chimney taken from an old kerosene lamp. The chimney holds a supply of birdseed which works down onto a turned wooden feeding tray. To replenish the seed, the basin is removed by unscrewing the hanger nut at the top. The tray, chimney and washbasin, plus a sheet-metal chimney holder, are held together with a 1/4-in. rod which runs through the center of the feeder. In windy localities, the vane-type feeder shown below affords welcome shelter from wintry blasts, as the plywood trees serve as vanes to keep the back of the feeder always to the wind. Resting on a ball thrust bearing, the feeder turns freely even in a light breeze. Note how the rod on which the feeder pivots is fitted in the upper end of the pipe standard. A wooden plug drilled



3/8\"

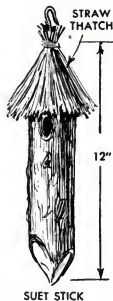
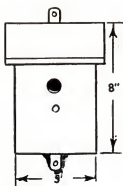
Feeders



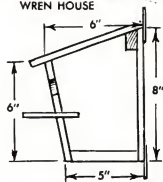
the Year 'Round

slightly undersize for the $\frac{1}{2}$ -in. rod is turned a little oversize for a drive fit in the pipe. Many species of birds, especially those that remain during the winter, are very fond of suet. A convenient method of offering this food is to bore a few 1-in. holes in a stick of firewood, add a decorative thatched roof and fill the holes with suet.

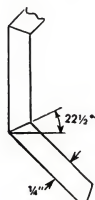
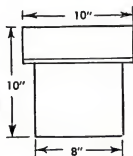
Songbirds that winter in the warm climates and have no food problem are always in need of homes and nesting boxes, and the ones pictured will provide desirable housing. A simple nesting shelf shown below will find favor among robins, phoebes and purple martins. These birds require houses with one side open and roomy floor area. The octagonal four-compartment house is suitable for the wren, chickadee, nuthatch, titmouse and the downy woodpecker. If only one partition is installed, making two compartments instead of four, and the entrance enlarged from $\frac{7}{8}$ in. to $1\frac{1}{2}$ in., the house will accommodate bluebirds, tree swallows, or violet-green swallows. Note that the walls of the house are screwed to the floor to facilitate cleaning. The rustic wren house shown at the top of the page is made by covering a boxlike unit with split twigs, the back being fastened with screws for cleaning. A $\frac{7}{8}$ -in. bit is used to bore the entrance hole in the house.



WREN HOUSE

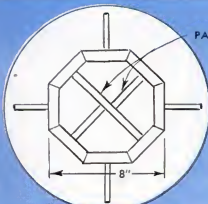
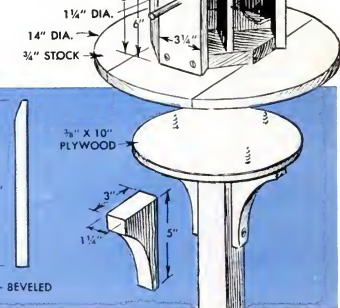


NESTING SHELF

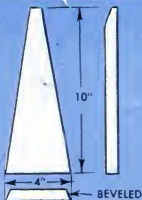


SUET STICK

Homes



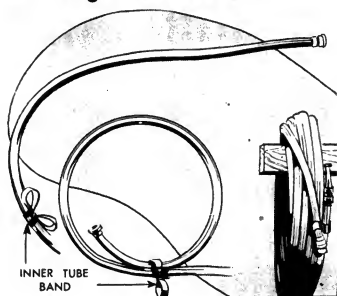
PARTITIONS



BEVELED

$\frac{3}{8}$ " X 10" PLYWOOD

Garden Hose Held Tightly Coiled With Large Rubber Band



You can overcome the difficulty of rolling a garden hose into a neat coil by simply taping a wide rubber band, cut from an inner tube, to the hose about 6 ft. from the end that attaches to the sill cock. The band is taped to form two loops, which project from each side. In use, one turn of the coil is formed and the connection end of the hose inserted through one of the loops, after which the hose is completely coiled and the nozzle end inserted in the other loop.

Diving Decoys Lure Wild Ducks



Tired of watching flock after flock of high-flying ducks pass up his decoy set, one duck hunter hit upon an idea that brought them in close. He simulated diving ducks by attaching a small lead weight to the

breasts of several of the decoys in his set, using a small screw eye turned into the wood and attaching the weight with a short length of wire. When placed in the water the weighted decoys floated in the manner shown. The natural appearance of the set lured the most wary flock leaders within easy range.—John Krill, Poland, Ohio.

Powdered Graphite Stops Squeaks Where Pipes Pass Through Floor

Water pipes that pass through holes in floors and beams often touch the wood and are frequently the source of annoying squeaks. One simple remedy is to apply dry graphite to the pipe and adjoining wood

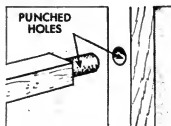
with a pressure-type applicator. Often this same treatment is effective in silencing squeaking floors. Locate the squeak, then drill a hole through the subfloor large enough to take the nozzle of the applicator. Usually only a small quantity of graphite applied in this way will silence the squeak.

John E. Wills, Brightwaters, N. Y.

Prick-Punching Mortise and Tenon Gives Glue Better "Tooth"

If you experience difficulty in getting a mortise-and-tenon joint to hold, roughen the surface of both the mortise and tenon before assembling them. A good way to do this is to prick the surface with an ice pick or even a prick punch, thus providing many small indentations into which glue will work and assure a good strong bond.

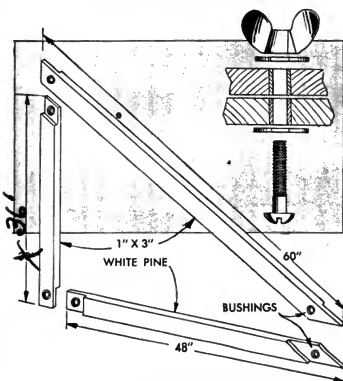
A. H. Waychoff, Phoenix, Ariz.



Collapsible Carpenter's Square Provides Additional Angles

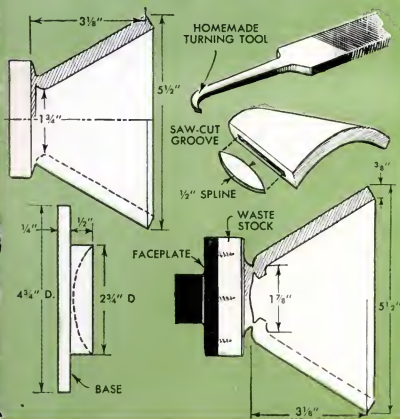
Easily dismantled for convenient storing and carrying, this knock-down square provides the carpenter with 30-deg. and 60-deg. angles as well as a right angle. It is made from well-seasoned white pine, each piece being dressed straight and the joints half-lapped and drilled to take 1/4-in. bushings. To prevent warpage, finish the three pieces with shellac and then wax. Assemble with brass bolts, washers and wing nuts.

Richard Hanscom, Elmhurst, Ill.

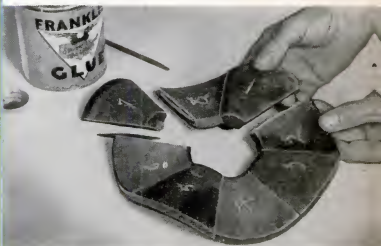




Ruffled FRUIT DISH



First, turn two deep bowls of identical over-all size, being especially careful to bring the wall thicknesses to precise dimensions. Note in the details at the left how each bowl is undercut at the bottom by means of a tool made from an old file



Now, cut each bowl into segments of equal size on the circular saw. Number the segments and groove each one on both sides to take splines cut from veneer stock. Then arrange them side by side with concave and convex sides alternating as shown

Lower left, here's what you end up with after finishing. You may have difficulty convincing craftsmen friends that it was actually turned on a lathe

This is the tricky operation — turning the opening for the base after assembling the ruffle, or piecrust, which forms the dish. Lathe-spindle speed should not exceed 300 r.p.m. and cutting tool must be razor-sharp. Take a very light, scraping cut



100-POWER

You can build this powerful microscope at a cost of only a few cents for materials. It also serves as a polarizing microscope and can be used for taking photomicrographs. A single dry cell supplies the illumination

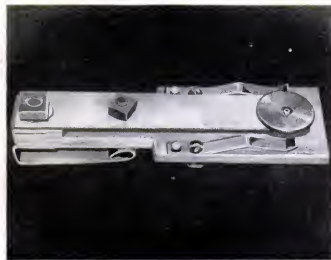
By William George Esmond

STUDENTS on summer field trips, amateur experimenters and others who must study the structure of minute objects, will find this microscope of novel construction and practical use. With a lens fashioned from the tiny bulb of a pen-type flashlight, it magnifies approximately 100 diameters. Using an eyepiece of 1-in. focal length, magnification up to 300 diameters is obtained. Although the resolving power of such a simplified optical system is limited, it does give sufficient definition for practical purposes and also for simple photomicrography, as proved by the sample photomicrograph of a mosquito antenna at the left. The microscope also can be made for use as a hand magnifier as in the right-hand photo below.

The first thing to do is separate the tiny lens from the pen-type flashlight bulb by breaking the bulb as in the lower left-hand detail on the opposite page. Then trim the excess glass from the bottom of the lens by breaking away small pieces with pliers. Be careful not to scratch the surface of the lens. Now, drill a hole through the center of a disk of $\frac{1}{16}$ -in. sheet metal and

Illumination from an ordinary pen-type flashlight bulb is sufficient for ordinary work, a single dry cell furnishing ample current. Other light sources may be used

Pocket-size microscope, or hand magnifier, can be made by attaching lens mount and slide holders to a piece of $\frac{1}{4}$ -in. plywood. Handy for students in the field



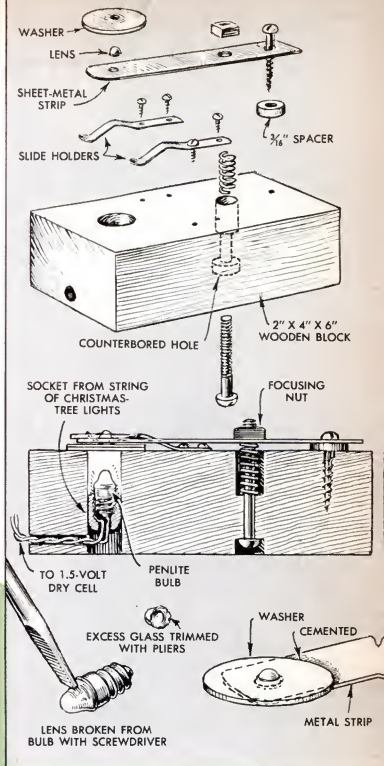
MICROSCOPE

then ream the hole with a taper reamer so that the lens fits snugly with the bottom flush with the surface of the metal. Cement the lens in place with model-airplane cement. Then cement the disk to a $\frac{3}{4}$ x 5-in. metal strip as in the lower detail at the right. The lens must be centered over a hole drilled near the end of the metal strip, the hole being slightly larger than the diameter of the lens.

The manner of assembling the lens mount on a wooden base and providing a focusing adjustment is shown in the details at the right. The lens mount is anchored securely to the base with a round-headed screw driven through a hole drilled near the end of the metal strip. A $\frac{7}{16}$ -in. spacer is placed between the metal strip and the wood. A third hole is drilled through the strip about 1 in. from the screw to take a $\frac{3}{16}$ -in. stove bolt. The $\frac{3}{16}$ -in. hole through the wood is counterbored from both sides of the base as in the sectional view. The longer counterbore houses a coil spring which provides sufficient tension on the lens holder to hold it tightly against a focusing nut.

An ordinary microscope slide is used to hold the object under the lens. Slide holders, or hold-downs, are fitted on each side of the lens holder. Adequate lighting of the slides is accomplished by fitting a Christmas-tree lamp socket in a hole drilled through the base at a point directly under the lens and using a bulb from a pen-type flashlight. A single dry cell supplies ample current. The instrument can be made to serve as a polarizing microscope by placing a small square of Polaroid glass under the slide and mounting another over the lens to serve as an analyzer.

An eyepiece of 1-in. focal length mounted over the regular lens provides all the advantages of compound microscope. Gives magnifications up to 300 diameters





SPRING-TYPE
PAPER CLIP

Large Clip on Electric Socket Holds Lamp Where Needed

By attaching a large, spring-type paper clip to the light socket on an extension cord, the socket can be clamped onto a chair, table or other object and held where needed. If necessary, enlarge the hole in one of the clip handles so that it will fit over a short nipple turned into the socket. Then, tighten a nut against the handle as shown.

P. Casperson, El Cajon, Calif.

Hammer Handle Attached "to Stay"

To fit a hammer head with a handle that will never loosen, first soak the handle in glycerin for a few days. Rasp it to fit and start it into the head, driving it about halfway through. Next, heat the hammer in an oven to expand the eye in the head. Then finish driving in the handle and insert the usual wedge.—Henry Muller, Danboro, Pa.

Rubber Bands Hold Chair Cushion



RUBBER
BANDS

A cushion can be kept in position on the back of a lawn or porch chair with a couple of long strips of rubber cut from an old inner tube and used as indicated. Large-headed tacks will hold the ends of the rubber

strips to the back of the chair. If tacks having large heads are not at hand, use small cardboard disks or metal washers under the heads of smaller tacks.

C-Clamp Drives Nail in "Tight" Spot

The next time you find it necessary to drive a nail where it cannot be struck with a hammer, use a C-clamp as pictured. Force the nail almost through the work by tightening the clamp screw, then loosen it, move the swivel pad of the clamp to one side to permit the nail point to pass, and again tighten the clamp to drive the nail the rest of the way.

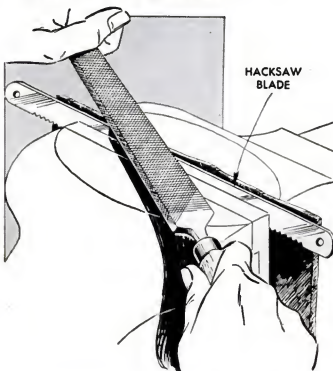
Louis Hochman, Sherman Oaks, Calif.



Weasel Scent Protects Trees

When heavy snows keep rabbits from finding their regular food, they often venture into orchards where they damage the fruit trees by gnawing off the bark. A few drops of weasel scent, applied to the base of each tree, will serve to ward off the vandals.—R. A. Jenkins, St. Louis, Mo.

Back Edge of Hacksaw Blade Used as Filing Guide



HACKSAW
BLADE

A hacksaw blade makes an ideal guide for filing straight edges on work. Make sure the blade is not curved and lock it smooth edge up in a vise with the work as shown. As the blade is so hard that a file will not "touch" it, the work can be cut down to the edge of the blade but no deeper. If the work is comparatively wide, put a blade on each side, aligning them with the edges of the vise jaws.

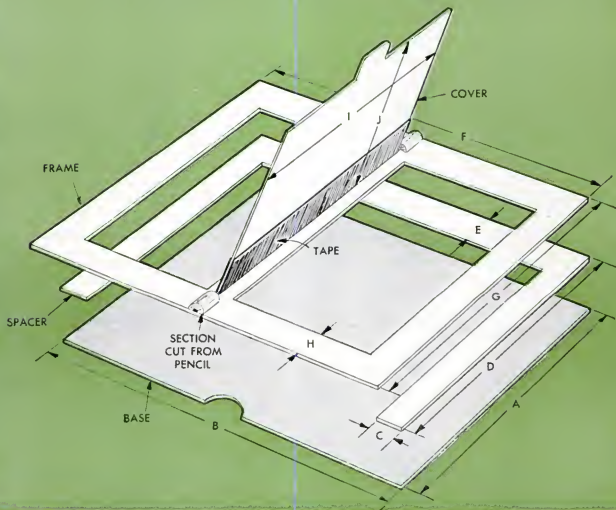
Hugh Lineback, Stillwater, Okla.

DOUBLE-PRINT FRAME

PERMITTING two images to be exposed on a single sheet of enlarging paper, this simple slip-in printing frame saves considerable time when making a number of duplicate enlargements. The frame is made in the form of an envelope, the paper being slipped into the frame and registered automatically under a double-opening mask. A hinged flap, which covers one side of the mask during the first exposure, is simply flipped over to protect the exposed half of the paper while exposing the opposite half. To make the frame, lay out the four pieces on fairly heavy mounting board. The width of the division strip in the masking frame should be twice the width of the print border. The spacer, which registers the print, is glued between the top and bottom pieces. The flap is hinged to the frame by taping a length of stiff wire to the edge of the cardboard and inserting the projecting ends in split sections of a lead pencil which are cemented to the frame.



KEY TO FRAME DIMENSIONS										
	A	B	C	D	E	F	G	H	I	J
5" X 7"	5½"	7¼"	¾"	5½"	½"	7¾"	6"	¾"	5"	4"
8" X 10"	8¾"	11½"	¾"	8¾"	¾"	11½"	9½"	1"	8½"	5¾"
11" X 14"	12"	16"	1"	12"	1"	16"	13"	1¼"	11"	8"

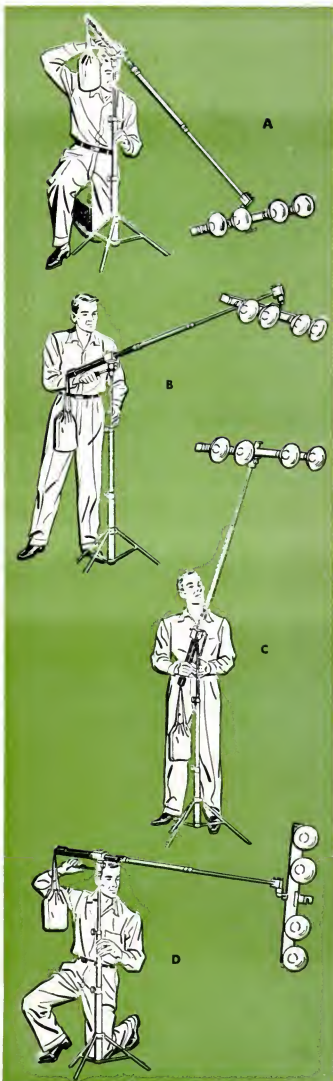


HANDY Photoflood KIT

By M. G. Winterton

BUILT AROUND a standard photoflood bank of the type familiar to home-movie photographers, this handy lighting kit provides the camera man of limited budget with the ultimate in inexpensive lighting equipment. Incorporating such standard items as a unipod and a common tripod, the light bank is readily adapted to a highly versatile boom light which offers a combination of directional adjustments that will handle almost any lighting situation. In addition, the bank can be used as a central control point into which supplementary fill-in lights can be plugged to augment direct frontal lighting. A glance at the illustrations at the left will give a comprehensive idea of the many versatile applications to which the boom light may be applied. Used in conjunction with a pan head and a ball-joint tripod, the light bank can be directed upward from low angles, A, which is especially desirable when working with a wide-angle lens. Or, the light can be directed from a normal frontal position, B, a position ideal for color-movie work. It's perfect for high overhead illumination, C, and it allows the subject to be adequately side-lighted, D, with the light bank in either a horizontal or vertical position. Built-

Screw hooks at the corners of the lift-out board provide a reel for storing up to 50 ft. of extension cord

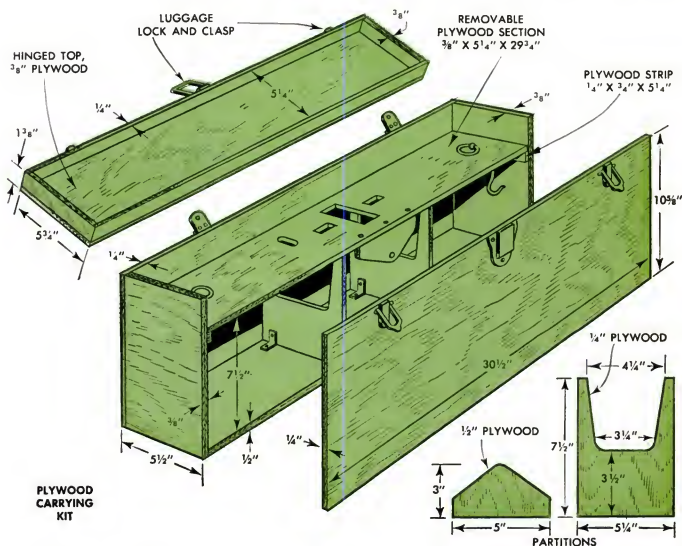


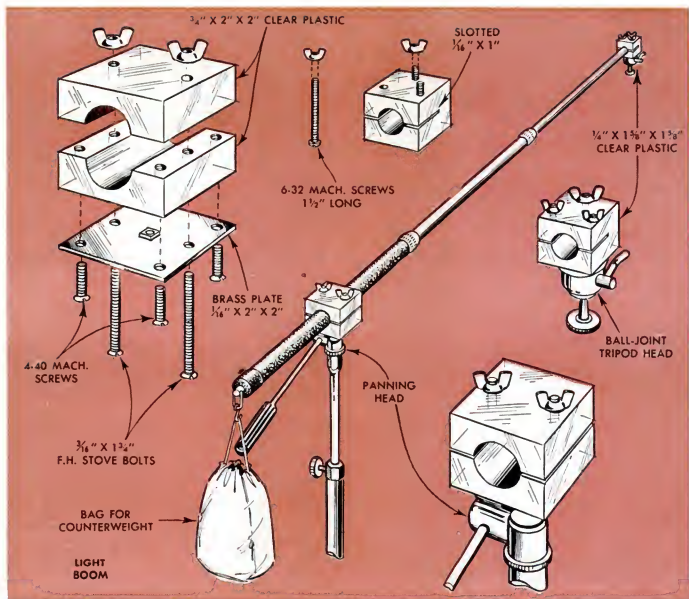
in wiring features of the light bank itself permit dimming, as well as a selection of different lamp arrangements most desirable for the particular setup. Also, the fact that the bank can be suspended practically in mid-air over the subject means that the tripod supporting the lights can be kept well out of the picture.

Tucked in a specially designed carrying case, the photo flood unit is transported and stored compactly without removing the bulbs. In addition, there's ample room for all related pieces of equipment, including 50 ft. of extension cord. The drawing below details the case. It is made entirely of plywood, the ends being $\frac{3}{8}$ in. thick, the bottom $\frac{1}{2}$ in. thick and the front and back $\frac{1}{4}$ in. thick. Resembling a machinists' toolbox, the case has a "tray" for two light stands, boom arm, etc., and is fitted with brass luggage hardware and a lock. If desired, all edges of the case can be covered with $\frac{1}{2}$ -in. chrome angle trim. The lamp unit is suspended upside down in the case, a feature which safeguards the bulbs from breakage. The original lamp unit was held to the underside of the lift-out shelf by a thumb nut which engages a hole in the lamp bracket. The shelf rests on cleats screwed to each end of the case, and large screw hooks



Utilizing two light stands in conjunction with the photo flood unit, lamps can be spotted remote from the parent unit and conveniently dimmed and controlled by its built-in switches. Here, two side lamps are being used apart from the master bank which is shown being supported vertically by light stand





placed at each corner of the shelf on the underside serve as a reel on which to wind an extension cord. Two lift-out rings are attached to the top side of the shelf and suitable openings are cut in the shelf to allow the unit to set flush. Finally, two U-shaped plywood partitions fastened to the bottom of the case with small corner

irons provide storage space for an extra photoflood bulb.

The boom light is adapted from a regular three-legged tripod, plus a single-leg, or unipod, and a ball-joint tripod head, the latter being clamped to the outboard end of the boom. As no alterations are required in either the unipod or the tripod head, both

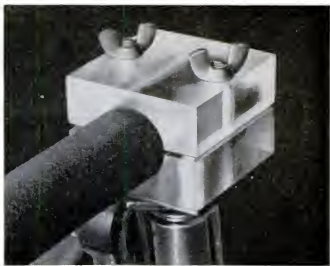
This view shows how the lamp unit is held to the lift-out shelf with a single screw through bracket

Fastened to the lift-out shelf, the photoflood bank is suspended in an inverted position to avoid breakage





With the bulbs removed and replaced with female plugs, the light bank serves as a central control receptacle for plugging in individual photofloods



Two wing nuts are provided to tighten both plastic clamps around the boom. Note, below, that a third one is added to permit attaching the tripod head

can still be used for their regular purposes. The drawing, above left, shows how the clamps are made which hold the unipod to the pan head of the tripod and the ball-joint head to the outboard end of the unipod. The original ones were made of plastic but they also can be made of hardwood. The clamp at the outboard end of the boom differs from the other in that it is of one piece and is slotted. Also, an extra hole is provided for attaching the ball-joint head. In the case of the boom clamp, a metal plate is provided with a $\frac{1}{4}$ -in. stove-bolt nut for attaching the clamp to the pan head.

A weighted cloth bag hung over the end of the boom serves as a counterweight to offset the weight of the photoflood unit. The bag can be carried empty in the case and then weighted on location with any heavy articles that might be available. The completed case can be finished natural and given two or three coats of varnish.



Large Print-Retouching Brush Used to Make Several Small Ones

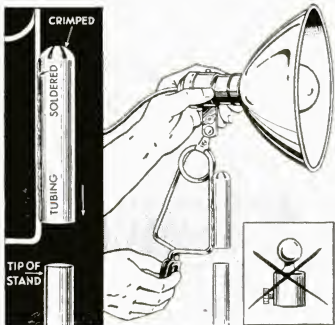
Instead of purchasing a number of small retouching brushes, buy only a large one and make the small ones from it. In this

way you not only save money, but also can make the brushes any desired size. To make the small brushes, dismantle the large brush and separate the bristles into the required number for each small brush. Cement them between two thin pieces of balsa wood and then shape the wood-block assembly to fit into the eraser ferrule of a lead pencil. The ferrule is flattened to hold the block.



Repairing Developer Trays

Don't throw away a developer tray that leaks. You can repair it easily with two lead washers and a small machine screw. Simply place a washer on each side of the hole and draw up tightly with the screw. Coat the repair with rubber-base paint.



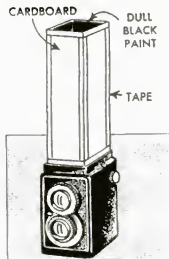
Improving Clamp-On Reflectors

Before some clamp-on photoflood reflectors can be set on a lamp stand, it is necessary to remove the clamp and replace it with a ball-type adapter, that is, unless the reflectors are equipped with a special means of making the attachment such as the one illustrated. This simple improvement consists of a length of tubing, which is slit and crimped at one end and soldered to an arm of the clamp, as shown. The tubing should be just large enough to slide over the end of the lamp stand.

❗ Slipping a yellow filter over the lens of your movie projector will break the monotony of straight black and white.

Hood Extension for Reflex Camera Permits More Convenient Support

This cardboard extension for the focusing hood on a reflex camera will permit you to hold the latter farther from your face than is normally possible. For instance, when making waist-high shots, you can support the camera against your waist and be able to see the viewer while standing erect. To make the hood extension, fold a sheet of thin cardboard into a rectangular tube of the desired length to fit over the regular focusing hood. Paint the inside surface a flat black and assemble the tube with masking or cellulose tape.



Don't Wrap Small Equipment In Focusing Cloth

The habit of wrapping an extra lens, exposure meter or other delicate piece of equipment in a focusing cloth, in order to guard against scratches, sometimes results in more serious damage to the equipment. This may happen when, forgetting that something is wrapped in the cloth, you pick it up and the equipment spills.

Popular Mechanics Book Shop

Popular Mechanics Ranch House

Dreams do come true. At least you can make one of them come true by building this dream home yourself. Seldom has an architect "wrapped up in one package" such beauty and comfortable living as you will find in this home. It is made inside and out of plywood to give unheard of beauty and long life at low cost—just \$7450 for materials. Designed to be built by the amateur, the house can be started with only the basic part—two bedrooms, living room-dining room area and carport—with garage and breezeway added later. When this is done the carport becomes a third bedroom. The book gives complete step-by-step instructions so that anyone can build this house. There are hundreds of construction photos and detailed plans. Book, \$3.50. Set of blueprints, \$13.50. Book and blueprints, \$15.00.

Planning Your Home Workshop

To the man who likes to make things, there's nothing quite as enticing as a well-planned

and arranged home workshop, whether it be just a simple one with a few hand tools, or an elaborate one complete with power tools. Send for this book and get your shop started right. You'll be surprised how much you can get into a small space when everything is arranged correctly. It's more fun to work in a well-planned shop, too. A remittance of \$2.50 will bring the book to your home.

You Can Make a Stradivarius Violin

Here is a project for the man who likes to make really fine articles. Only a limited number of tools are needed, and any man with average craft ability can produce an instrument equal in quality and tone to many that can be purchased. In the book Joseph V. Reid, maker of hundreds of fine violins, tells how to make a violin patterned after one of the most famous models of Antonio Stradivari. In addition to step-by-step instructions, there are eight large plans in a pocket inside the book cover. Book and plans \$3.50.

All books available from Popular Mechanics Book Dept., 200 East Ontario Street, Chicago 11

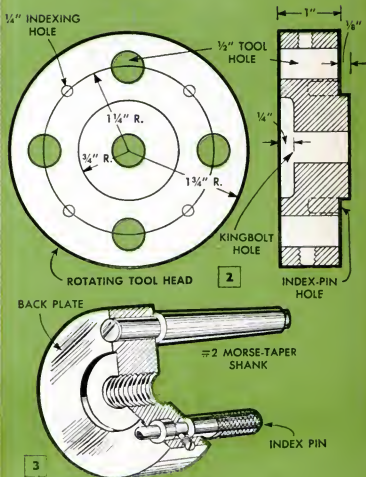
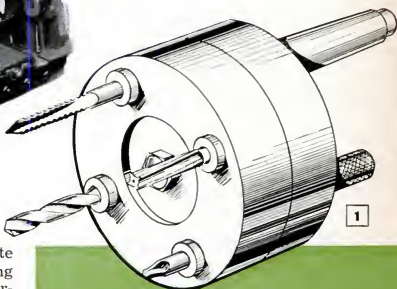
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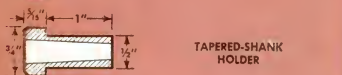
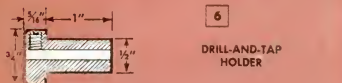
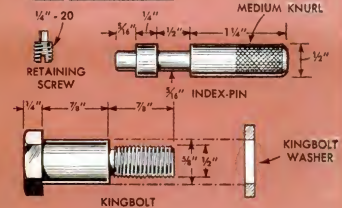
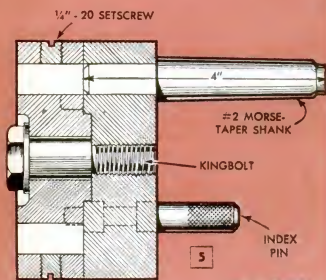
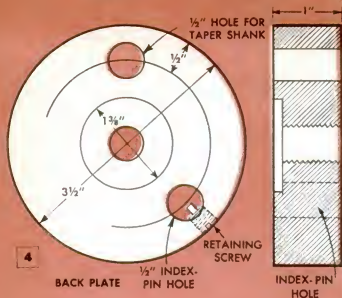
TAILSTOCK TURRET ATTACHMENT



By C. W. Woodson

RAPID PRODUCTION of duplicate parts on the ordinary metal-turning lathe calls for a turret. While the bed turret is expensive to purchase outright and difficult to make in the small shop because of the many exacting machine operations, the tailstock turret can be made on the lathe on which it is to be used. On a variety of work involving the accurate machining of small parts, the tailstock turret is fully as fast as the bed type and is especially efficient on parts machined from finished bar stock passed through the headstock spindle. For average work of this type most machinists would specify a four-position turret of the type shown in Fig. 1. In this unit, drills, taps, dies, reamers, run-down cutters and certain other individual tools can be mounted in the rotating head and rapidly brought into position simply by releasing an index pin and rotating the head a quarter turn. Tools with $\frac{1}{2}$ -in.-dia. round shanks are mounted directly in the holes drilled in the turret head and bushings are provided to take special tools with smaller shanks. In ordinary practice, the tapered shank of the turret is inserted in the tailstock quill, or spindle, and the tools are fed into the work by means of the handwheel. A hand-lever tailstock speeds up turret operations considerably, especially where long strokes are



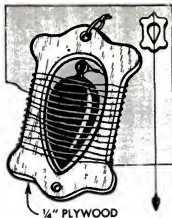


necessary to machine certain kinds of work.

The tailstock turret shown in Fig. 1 consists of the rotating head, Fig. 2, and a fixed backplate carried on a taper shank, Fig. 3. The two parts are held in working position by means of an index pin and a stripper bolt, or kingbolt, Fig. 5. Note that on the shouldered face of the head the height of the projection is given as 1/8 in., Fig. 2. When machining the recess in the backplate, make an allowance of about .002 in. for clearance and break the corner of the projection approximately 1/4 in. at a 45-deg. angle. The projection should fit the recess with a variation in diameters of not more than plus or minus .002 in. Some machinists would bring these dimensions even closer. The same accuracy must be maintained when machining the stripper bolt, especially the length dimension between the shoulder and the bottom of the bolt head. The stripper-bolt washer must be machined and lapped to precise thickness dimensions. Although left-hand threads are shown on the stripper bolt, Fig. 5, in accordance with the construction of the original unit, the threads may be cut right or left-hand as desired. The stripper-bolt hole should be reamed to a 5/8-in. dia.

Although it is possible to make a serviceable turret from ordinary cold-rolled stock, a professional job requires the use of tool steel for all parts. Where the weight of the unit may be objectionable, a free-machining aluminum alloy can be used for the backplate and the rotating head. However, it will be necessary to drill the holes that take the tools oversize and fit them with thin-walled tool-steel bushings. It also will be necessary to bush the hole for the stripper bolt. The bushings must be machined and ground to a drive fit. Although machining the index pin and the retaining screw are simple lathe jobs, the dimensions of the parts should be held to rather close limits, as a loose index pin can cause inaccuracies in the work. Registering index holes in both the backplate and the rotating head should be reamed to the finish dimension. Machining the toolholders, Fig. 6, also calls for a high degree of accuracy. They should be machined and ground to a light slip fit in the holes in the rotating head. The holders should be held in place with flat-pointed setscrews. Do not use cup-pointed setscrews as they will damage the surface of the holders when tightened, making them difficult to insert and remove. Machine the straight shoulder cut on the tapered shank to a drive fit in the hole in the backplate. This is done accurately by inserting the shank in the tapered end of the lathe spindle and supporting it by running up the tailstock center. Turn it slightly oversize and press in place.

Plumb-Bob "Carrying Case"



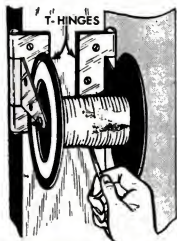
A unique holder for your plumb bob can be made in only a few minutes from a scrap piece of $\frac{1}{4}$ -in. plywood. Just cut an opening in the wood large enough for the plumb bob to fit into and drill two holes, one to which the cord is attached and the

other to provide for hanging the holder. Note that the bob is held in the opening by the cord, which is wrapped around the holder. Thus, the pointed plumb bob can be carried safely in the pocket.

Abrasive Serves as Lock Washer

To lock a nut in place against a washer or steel surface where the bolt is too short to permit a lock washer to be used or in cases where one is not at hand, place a few grains of abrasive, such as silicon carbide, under the nut before drawing it up tight. The hard grains will embed in both the work and the underside of the nut, thus locking it in place.

T-Hinges Form Folding Bracket To Support Spool of Wire



Screwed to a wall, post, or other suitable support, a pair of T-hinges provide ideal supports for reels of wire or other materials that are rolled. The hinges are spaced the desired distance to accommodate the reel, and a bolt or rod, threaded at

both ends, is used as an axle for the reel. When not in use, the hinges can be folded flat against the wall, an advantage where working quarters are limited.

Fishing Lines Stored Safely

Before storing your fishing lines, be sure they are thoroughly dry. Then wind them onto spools—film spools are ideal for this—and place them in a moistureproof bag. This will prevent rotting and will protect the lines from harmful insects.

Ralph E. Ellison, Alum Creek, W. Va.

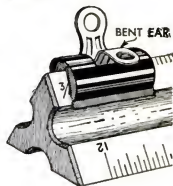


Ventilation for Circular Henhouse Provided Through Center Stair Well

Chicken farmers who are planning to build new henhouses will want to consider the advantages of the "silos" type pictured, which is 70 ft. in diameter and pens 1500 birds on each of three levels. Easy access to pens and community nests is made possible by a stair well from which eggs can be gathered quickly without disturbing the hens. The stair well is topped with a cupola to provide a central air duct.—Eleanor Gilman, Middletown Springs, Vt.

Adjustable Marker Identifies Scale On Draftsman's Rule

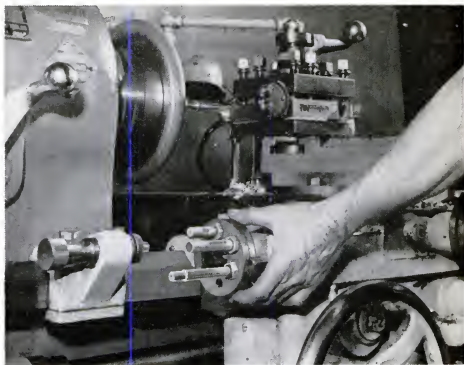
The loss of time often experienced in locating the desired scale on a draftsman's rule, after laying it aside for a few minutes, can be prevented by marking the scale with a paper clamp. Place the clamp on the rule directly above the scale being used and bend over one of the ears or handles to indicate at a glance the correct side of the rule.—John W. LaLonde, West Allis, Wis.



Soaking a new paintbrush in linseed oil for a few hours before using it will make it easier to clean.

To save time on duplicate lathe jobs requiring several stop settings of various lengths, one California shop owner fitted each metal-turning lathe with a multiple-stop unit as shown. They are attached to the carriages where they work in conjunction with regular stop switches on the beds. Each unit consists of two steel disks of equal size, one of which can be rotated to move any one of several stop pins of different lengths into position to contact the stop switch. In this way, carriage travels of various, predetermined lengths can be obtained by merely rotating the disk to bring the desired stop pin into position. In production work, where more than one job may be done on a particular lathe, a set of stop pins can be made for each job. The pins are easily removed

Multiple-Stop Unit on Lathe Carriage Is Timesaver When Making Varied Cuts



as they are screwed into the disk and held by locknuts. — Thomas E. Stimson, Jr., Santa Monica, Calif.

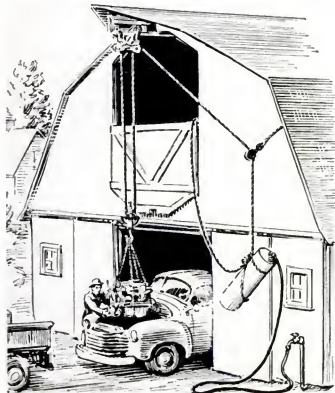
Air-Hose Attachment Removes Chips From Drilled Holes

If you experience difficulty in blowing all metal chips from a drilled hole with your present air-hose attachment, a simple one that you can make will take care of the trouble. Just solder, thread or otherwise attach a length of small copper tub-

ing to the present attachment and shape it for easy insertion in the hole. This will permit air to be directed from the bottom of the hole to blow the chips upward and out of the hole.

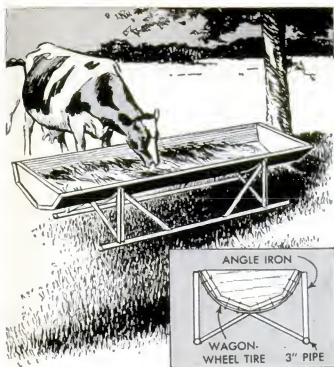
Al Rhoades, Los Angeles, Calif.

Hay Carrier and Hot-Water Tank Used as Truck-Motor Hoist



A farmer who wanted to put a new motor in his pickup truck, but who had no hoist to lift it, utilized the hay carrier on his barn and a hot-water tank to do the job singlehanded. The carrier was run out to the end of the track and the rope sheave attached to the motor by a chain sling. The lift rope was pulled out of the barn through the hay door, run through a pulley attached to the side of the barn, as shown, and tied to a hot-water tank to hold the latter a few feet from the ground. This left the weight of the tank pulling up on the motor. Then, by means of a near-by hydrant and garden hose, water was run into the tank until it became heavy enough to counterbalance the motor so it could be swung into position easily.

☛ When glazing windows, lubricate the putty knife by rubbing it on a pad saturated with linseed oil. This will help do a faster and smoother job, and will seal the surface of the putty for durability.



Range Trough of Heavy Planks Rests on Pipe Skids

There is slim chance of cattle tipping over this low-slung range trough which is made of heavy planks cradled in sections of wagon-wheel tire. The tire sections are welded to an angle-iron frame which, in turn, is welded to two lengths of 3-in. pipe. The latter may be bent upward at both ends to serve as skids, thus allowing the trough to be pulled with a tractor. Butting edges of the planks are beveled to form close-fitting joints and the planks are bolted to the tire sections as in the detail.

Hi Sibley, Nuevo, Calif.

Reducing Hammer in Water System

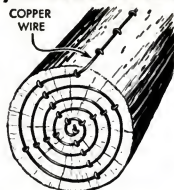
A short length of rubber hose inserted in the outlet pipe between the pump and the pressure tank will reduce water hammer and vibration noises in the farm water system. The hose, which absorbs pulsations in the pipe line, is slipped over the ends of the pipe and fastened with ordinary hose clamps, forming a pressure-tight joint.

Alfred J. Heyer, Jr., Cuba, Mo.



Pole Grounded by Uninsulated Wire

Any type of pole can be easily protected from lightning damage by grounding it with a length of uninsulated copper wire before it is set up. Starting at the top of the pole, staple a single strand of wire along its full length. Then bring the strand over the edge of the pole, stapling it to form a spiral on the lower end.



Grover Brinkman, Okawville, Ill.

Cattle Guard From Iron Pipe

To eliminate the necessity of a gate where the fence crossed a narrow road this cattle guard was made up and placed over a shallow ditch. Twelve lengths of heavy



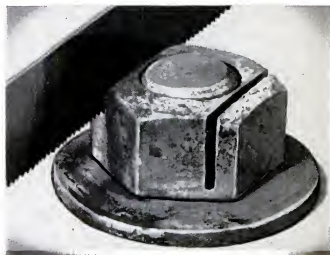
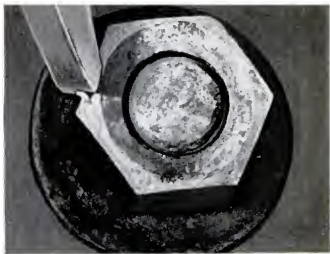
iron pipe spaced 6 in. apart are welded to iron stringers which rest on shallow concrete abutments. Three reinforcing rods are welded across the tops of the pipes to keep them rigidly in place.

Milk Can Forms Shop Stool

An inexpensive farm-shop stool can be improvised from a rusted or leaky milk can that is beyond repair. Bolt a square board to the can cover, counter-sinking the bolt heads in the top surface to provide a smooth seat. The handles of the can aid in carrying the stool from place to place as needed, and small parts used in the shop may be stored inside the can.



THREE WAYS OF LOOSENING A FROZEN NUT

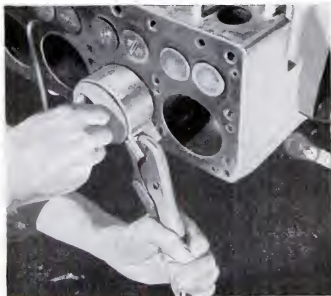


By R. F. Donovan

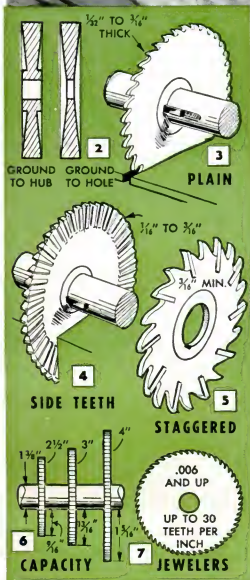
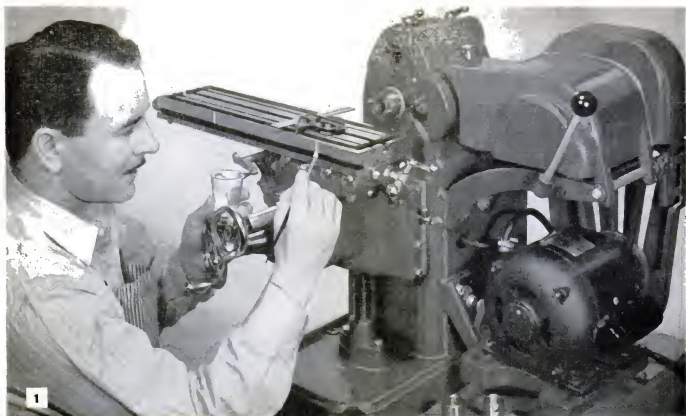
When large nuts won't yield to maximum wrench pressures, because of rust and corrosion which have damaged the threads, don't use additional leverage on the wrench or you may twist off the bolt below the nut. If the nut is on a flat surface and is easily reached from the side, first try striking it sharply with a hammer, hitting the flats from both sides where possible. Then try the wrench again. Usually this treatment will loosen the most stubborn nut but, if it fails, try using a cold chisel as shown in the upper right-hand photo. Nick a corner of the nut with the chisel, then incline the chisel and strike it with the hammer. Keep the chisel inclined outward as well as backward so that the full force of each blow is expended as a turning thrust against the nut. Should this fail, a last resort is pictured in the photo at the right. Saw two slots in the nut, one on each side of the bolt and as close to the threads as possible. Then twist off the two halves of the nut with a wrench.

The nut usually will break into two parts as soon as pressure is applied. Where it is not possible to reach the nut from either side, drill two or more holes into it from the top, as shown in the upper left-hand photo. The holes should be drilled as close to the bolt threads as possible without cutting into them. After the nut has been loosened in this way, unscrew it with a socket wrench.

Piston-Ring Compressor Is Tightened With Pressure Lock Wrench



In the absence of a piston-ring compressor, one can be improvised from a band of sheet metal and a pressure lock wrench. Use a band that is long enough to go around the piston and extend about $2\frac{1}{2}$ in. It should be wide enough to at least cover the ring grooves. In use, place the band around the piston over the rings, and shape it to the contour of the piston as much as possible with your hands, bending the projecting ends outward at a slight angle. Then, grip the ends with the pressure lock wrench to tighten the band on the rings. When bending the ends of the band, make the bends at a slight angle so that the compressor will be wider at the top than at the bottom. This will permit the rings to enter the compressor easily.



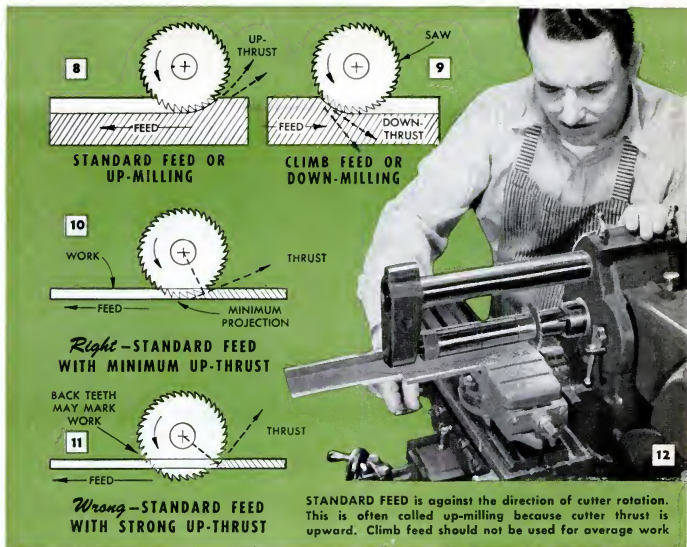
SAWING on the MILLING MACHINE

By Sam Brown

EXTREMELY accurate sawing of metals and plastics to produce parts in duplicate, also cutting slots, slitting and deep grooving are common operations on the bench milling machine. This is particularly true in the home model shop and also in small professional and specialty shops where the milling machine is used for a variety of cutoff work, which is usually done with other tools.

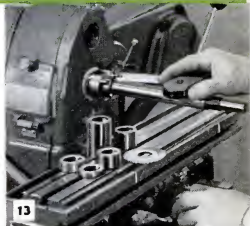
Metal-slitting saws: The plain slitting saw, Figs. 2 and 3, is similar to the ordinary hollow-ground blade made for cutting wood, except that it usually is somewhat thicker and the arbor hole is larger and is swaged for a key. Plain slitting blades are furnished hollow ground to the arbor hole, Fig. 2, and hollow ground to the hub. The latter type is preferred, although both types are widely used on light work. Heavier work requiring deep cuts calls for the use of special slitting saws having side-cutting teeth to provide chip clearance and prevent the saw from heating and jamming. These saws are of the inserted-tooth type and are furnished with in-line teeth as in Fig. 4 and also with staggered teeth as in Fig. 5. Slitting saws also are furnished in jeweler's sizes as in Fig. 7. A bench-type milling machine of average specifications will swing slitting saws from 2½ to 4 in. in diameter, the maximum depth of cut ranging from ⅛ to 1⅛ in., Fig. 6. Although regular slitting saws are available in thicknesses of ⅛ in. and up, the thicker blades run more smoothly and show less tendency to weave in the

METAL-SLITTING SAWS of 2½ to 4 in. in diameter can be used on bench milling machine. The 3-in. saw is most practical for average use in slitting operations

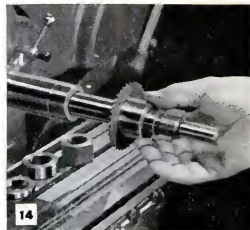


heavier cuts. An ideal average-sized slitting saw for the bench milling machine has a blade $\frac{1}{16}$ in. thick and 3 in. in diameter in the plain type, or $\frac{3}{16}$ in. thick in the staggered-tooth type.

Direction of feed: In ordinary milling-machine operation, it's standard practice to advance the work against the rotation of the cutting tool as in Fig. 8. In the tangent cut commonly used, the action of the cutting tool tends to push upward on the work and for this reason the operation is known in the shops as up-milling. The climb feed, Fig. 9, exerts a downward pressure and often is referred to as down-milling. Where possible, down-milling is desirable, as the operation exerts thrust in a direction in which the lighter milling machines are best able to support it. In some cases, however, down-milling may cause trouble due to backlash in the lead screw. As a rule it is not practical to remove backlash from the screw and, for this reason, down-milling (climb feed) is not recommended. Of course, there are exceptions, as when making very light cuts with a thin slitting saw and when facing, routing or profiling with an end mill. Here the thrust of the cutting tool in the average depth of cut on this work is considerably less than the force required to move the machine table. In production work the principal value of the climb feed is to catch a light cut coming and going as in Fig. 26. As a rule the up-thrust of standard feed can be minimized to some extent by using a tangent cut as in Fig. 10 when cutting off. Here, the saw is set to project only slightly beyond the work. Note the difference in the position of



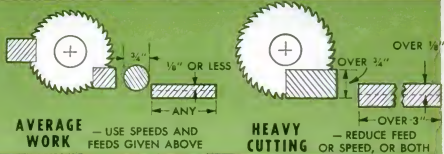
Above, spacing collars permit mounting saw close to spindle. Below, to avoid damage, use collar to push saw in place



MATERIAL	$\frac{1}{4}$ " X $2\frac{1}{2}$ " DIA. SAW		$\frac{1}{2}$ " X 3" DIA. SAW		$\frac{1}{2}$ " X 4" DIA. SAW	
	SPEED (R.P.M.)	FEED (PER REV.)	SPEED (R.P.M.)	FEED (PER REV.)	SPEED (R.P.M.)	FEED (PER REV.)
ALUMINUM	450	.012	450	.012	450	.012
	=300 F.P.M.	=5.62 I.P.M.	=360 F.P.M.	=5.62 I.P.M.	=450 F.P.M.	=5.62 I.P.M.
SET PLASTICS	450	.012	450	.012	450	.012
	=300 F.P.M.	=5.62 I.P.M.	=360 F.P.M.	=5.62 I.P.M.	=450 F.P.M.	=5.62 I.P.M.
THERMOPLASTICS	225	.025	130	.025	130	.025
	=150 F.P.M.	=5.62 I.P.M.	=100 F.P.M.	=3.25 I.P.M.	=130 F.P.M.	=3.25 I.P.M.
YELLOW BRASS	225	.012	225	.012	130	.025
	=150 F.P.M.	=2.70 I.P.M.	=180 F.P.M.	=2.70 I.P.M.	=130 F.P.M.	=3.25 I.P.M.
CAST IRON (SOFT)	130	.025	130	.025	130	.012
	=85 F.P.M.	=3.25 I.P.M.	=100 F.P.M.	=3.25 I.P.M.	=130 F.P.M.	=1.62 I.P.M.
SOFT STEEL	130	.025	130	.012	130	.012
	=85 F.P.M.	=3.25 I.P.M.	=100 F.P.M.	=1.62 I.P.M.	=130 F.P.M.	=1.62 I.P.M.
MACHINE AND LOW-CARBON STEEL	130	.012	130	.012	130	.006
	=85 F.P.M.	=1.62 I.P.M.	=100 F.P.M.	=1.62 I.P.M.	=130 F.P.M.	=.75 I.P.M.
MALLEABLE IRON	130	.012	130	.012	130	.006
	=85 F.P.M.	=1.62 I.P.M.	=100 F.P.M.	=1.62 I.P.M.	=130 F.P.M.	=.75 I.P.M.
HARD STEEL	60	.006	60	.006	60	.006
	=40 F.P.M.	=.37 I.P.M.	=50 F.P.M.	=.37 I.P.M.	=60 F.P.M.	=.37 I.P.M.

NOTES

THIS TABLE USES FOUR STANDARD SPEEDS, 60, 130, 225 AND 450 R.P.M. IF YOUR MACHINE HAS OTHER SPEEDS, USE NEAREST SPEED. ALUMINUM AND SET PLASTICS CAN BE WORKED AT HIGHER SPEEDS IF DESIRED I.P.M.—INCHES OF FEED PER MIN. F.P.M.—SAW SPEED IN FEET PER MIN.



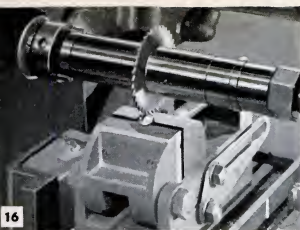
the saws in Figs. 10 and 11, and how lowering the saw in relation to the work increases the up-thrust. A cutoff setup that gives down-thrust with the standard feed is shown in Fig. 17.

Mounting the saw: Milling-machine operators always try to mount the saw as close to the spindle nose as possible, Fig. 13. When the saw can be mounted 3 in. or less from the driving end of the spindle it is possible to handle average work on the light machines without the outboard support, Fig. 12. The saw is mounted on the arbor between collars and generally is driven by friction alone, no key being used. Skilled operators always push the saw onto the arbor with a collar as in Fig. 14. This precaution prevents any possibility of damaging either the saw or arbor.

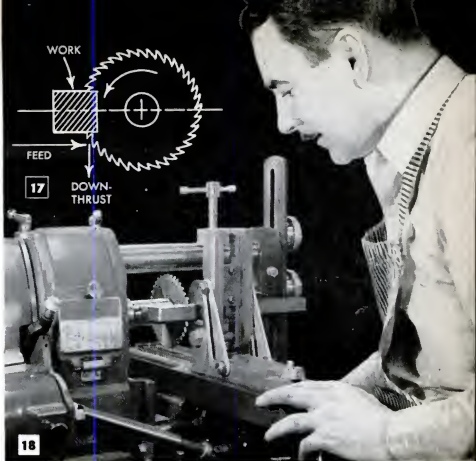
Speeds and feeds: Because of variables in every job it is not possible to tabulate the speeds and feeds with a degree of accuracy which will hold for all types of work. For this reason the values given in Fig. 15 are not all-inclusive, although they will form a suitable basis for reckoning speeds and feeds for average work on a light machine. Generally, slitting saws should be run faster than plain milling cutters. In some instances speed increases up to 100 percent will prove practical. The table feeds also can be in the upper brackets. Only rarely are the slowest speed and feed required by the nature of the work or its

machining properties. An average all-around speed for the saw, regardless of its diameter, is 130 r.p.m. This speed combined with a table feed of .012 in. per revolution gives good results on nearly all materials, except, of course, the harder steels. Heavy, deep cuts in any material very likely will require a reduction in either the speed or feed, or both, especially if a plain slitting saw is being used. The plain saw will build up considerable friction drag in a deep cut or a long cut in many nonferrous metals such as non-heat-treated aluminum alloys. A free-machining aluminum will permit a long, deep cut without jamming or heating of the saw. Using a slitting saw with side-cutting teeth will minimize any tendency to jam in long, deep cuts. The side-toothed saw also is best for cutting thermoplastics. These materials fuse at a heat of about 140 deg. F. and must be worked at slow speeds to reduce frictional heat and prevent jamming of the saw. Ordinary steels, brass and malleable iron work smoothly with a plain slitting saw at the speeds and feeds given in the table, Fig. 15. Work long, deep cuts in two passes at the feed given, rather than one pass at a slower feed.

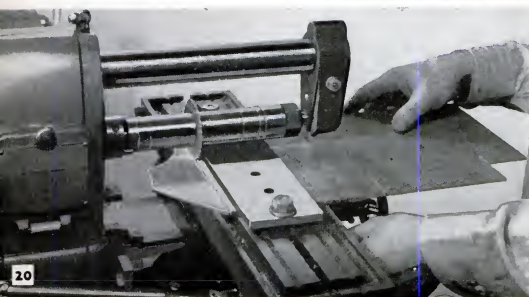
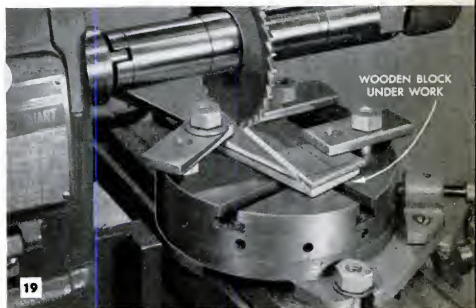
Job setups: The regular milling-machine vise is one of the most widely used accessories for setting up both production and variety jobs on the bench milling machine. It is supplied in both the plain and angle



types and permits holding a wide range of work by vise pressure alone, eliminating the need for blocking and clamping. Figs. 12, 16 and 18 show different types in use. The angle vise, Fig. 18, usually has a V-notch in the jaw, making it useful for holding rounds in either the horizontal or vertical position, Fig. 16. Also, a very rigid setup for cutting off is made as in Fig. 18. Here it will be noted that in the radial cut being employed, the feed is against cutter rotation but the thrust is down, as in Fig. 17. Using a 4-in. slitting saw, this setup permits cutting off 1 1/4-in. bar stock when the outboard support is not used, and 7/8-in. stock when overhang makes it necessary to use the outboard support as in Fig. 18. Work involving angle cuts generally should be mounted on an index table as in Fig. 19. If a through cut is called for, then the work should be mounted on 1/4-in. plywood as shown. Fig. 20 pictures a typical cutoff job on wide sheet stock. Because of the up-thrust of the



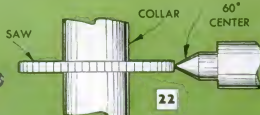
CUTTING OFF BY USE OF ANGLE VISE



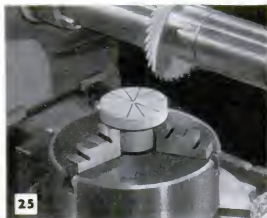
JOB SETUPS include most of the mountings used in plain milling. Angle vise is useful for heavy cutoffs, Fig. 18, where 1 1/4-in. bar stock is being cut with 4-in. saw rotating at 130 r.p.m. with a feed of .006 in. per revolution. When through cuts are made over table as in Fig. 19, the work should be backed with plywood. The up-thrust of standard feed requires a rigid clamp for support. The clamp should be cut from heavy bar stock and located as in Fig. 20



CUTTING A KEYWAY is best done with work mounted between centers of the type provided with an index head. One pass at 130 r.p.m. and .012-in. feed per revolution will cut $\frac{1}{8}$ -in. keyway



CENTER SAW ON 60° CENTER

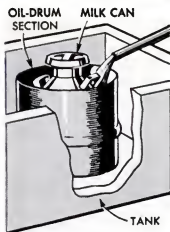


saw, it is necessary to use a heavy clamp bar. In this case, the clamping bar had to be $\frac{3}{8}$ in. thick and 3 in. wide to provide the required rigidity. When cutting off any similar work, always use a heavy bar to assure that there will be no movement of the work along the length of the cut as otherwise the saw may jam when it reaches a point near the center of the stock. Some work setups will require that the limits of table travel be marked on the side of the machine table as in Fig. 1. The work must be located between the marks to assure that the cuts will run off the ends as required.

Keyways are easily cut in long stock with the work mounted between centers as in Fig. 21. For this job the machine must be equipped with centers having an indexing head as shown. Any long cuts on either solid rounds or small-diameter tubing can be handled in this manner. Tubing also can be slotted in this way, although it will be necessary to leave a small amount of uncut stock at each end. The index head makes it possible to space the slots or

grooves precisely. The saw is centered as in Fig. 22. Another effective setup for cutting shorter keyways or tube slotting is shown in Fig. 23. Here the work is held in one of the table grooves by means of clamps arranged to permit the cut or cuts to be made without interference. The saw is first centered over the table groove, then the work is clamped in place and the depth of cut determined. This type of setup is useful in any kind of work where it is necessary that the saw approach the end of the work unimpeded by clamps or the heads of the index centers. The use of a three-jaw universal chuck mounted on the index table often is useful when milling small work on which the slitting saws of various thicknesses can be used. Usually the chuck is mounted on a special threaded spindle which fits in a tapped hole in the center of the index table as in Fig. 24. If the chuck is correctly centered on the index table it will automatically center any number of radial cuts on the work as in Fig. 25. The job pictured in Fig. 26 can be handled with this type of setup.

Milk Can Kept From Tipping When Set in Cooling Tank



As a partially filled can of milk may be accidentally overturned when set in a cooling tank, one farmer uses a section cut from an oil drum to hold the can upright in the water. The drum section is set directly under the water-supply pipe so that the can of

milk is submerged long before the cooling tank itself is filled. The drum keeps the can from tilting more than a few degrees.

Permanent Pad Sheet on Typewriter

If you use a "second" or pad sheet behind the copy sheet in your typewriter, instead of inserting it with each copy sheet, save time and trouble by attaching a permanent padding to the roller. To do this, trim a sheet of high-quality paper to the length of the roller, wrap it around the roller and use cellulose tape to hold the edge down.

David Nevin, Brownsville, Tex.

Cleaning Threads of Tapped Holes

Faced with the problem of cleaning rust from the threads in a large number of tapped holes, one mechanic did a little experimenting and came up with this unusual thread cleaner. He selected hex-head cap screws which



would fit the several sizes of tapped holes and ground a flat across the threaded end of each screw at the approximate angle shown in the detail. Before turning a cleaner into a hole, he dipped the threaded end in a half-and-half mixture of light machine oil and kerosene. This solution tends to soften hardened grease and grime and helps to loosen the rust. The cleaner is simply turned into the hole the full length of the threads and then backed out.

Cardboard Guard for Ruling Pen

A slotted piece of cardboard will keep the blades of a ruling pen from being dulled when stored. Just slide the board between the blades, the slot passing around the adjustment screw, and tighten the blades slightly to hold the board.

OCTOBER 1951



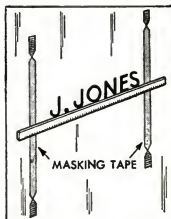
Opening Spring-Steel Lock Rings

The above illustrations show two emergency methods of opening spring-steel lock rings. In the upper photo, a cotter pin is inserted in the gap between the ends of the ring, and a screwdriver, the edges of which have been squared, is forced between the legs of the pin and turned. The lower photograph shows an example of how two small end wrenches can be used to open some lock rings of this type.

Reversed Masking-Tape Strips Support Letterer's Straightedge

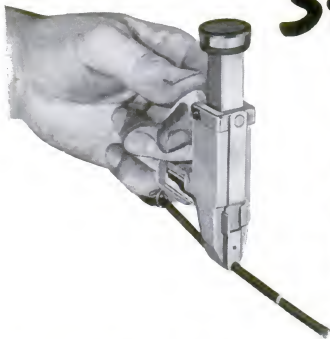
To hold his straightedge securely in place while laying out lettering on glass, one signwriter employs strips of masking tape. He

sticks the top end of the tape to the glass first, and then twists it one-half turn to bring the adhesive-coated side out. Near the lower end he again twists the tape to turn the adhesive-coated side in and sticks the lower end to the glass. A second strip is placed parallel to the first in the same manner. The straightedge can then be held in position by pressing it against the tape at any point.



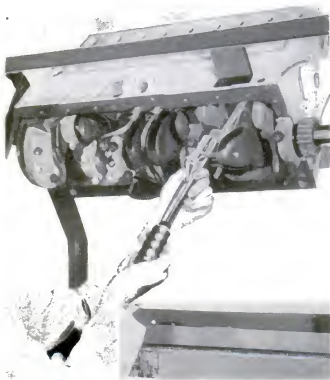
223

SHOPPING



POCKET-SIZE TACKER is designed for television, radio and telephone servicemen for use in stapling wiring along baseboards, around window frames, along joists and rafters and around difficult angles and corners where a hammer cannot be used. Tacker is fitted with front and rear guides which encircle wire and hold it firmly in position for stapling. After driving one staple, tacker is slid along wire to the next position. Staples are supplied in different colors

HAND TOOL, right, for joining sections of perforated pipe with spring clips works like a pair of pliers, except that the jaws open rather than close when the handles are pressed together. In use, the spring clip is inserted in slots in the jaws. As the handles are pressed together, the clip is expanded so that it can be slipped into the perforations near the ends of the pipe sections. After setting in this manner, the clip is tapped lightly near the ends

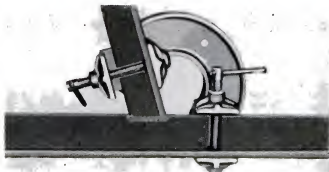


SMALL-QUANTITY RIVET SERVICE, above, has been established for home craftsmen, modelmakers, camera-repair shops and others who use various types of tubular rivets in small quantities in popular lengths from 3/32 to 1/2 in., and in diameters ranging from 1/16 to 3/16 in. Easy-to-use hand clincher tools and also washers to fit the three larger diameters are available. Assortments are neatly packaged

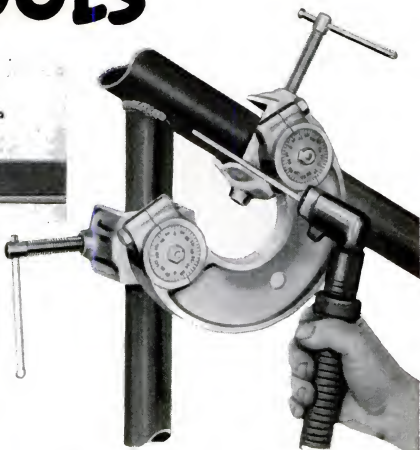


ONE-MAN PISTON SETTER, left, has been developed to reduce labor costs on auto, truck and tractor engines when repairs necessitate removal and replacement of pistons. Jaws of tool are designed to grip one of the connecting-rod bearing studs. Then the piston is simply pushed upward and out of the bore. To replace the piston the process is reversed, the tool being used to draw the piston into the cylinder from the bottom of the crankcase. Works equally well with the engine in the car or on a cradle as pictured

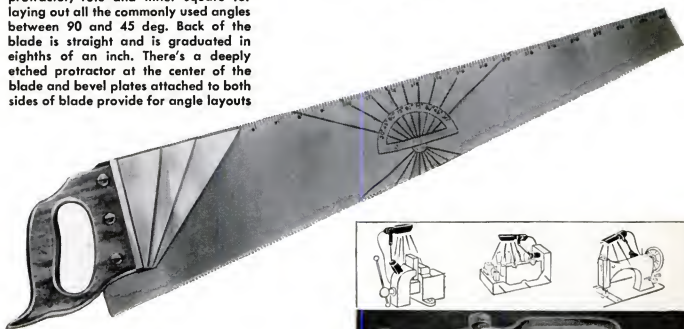
FOR TOOLS



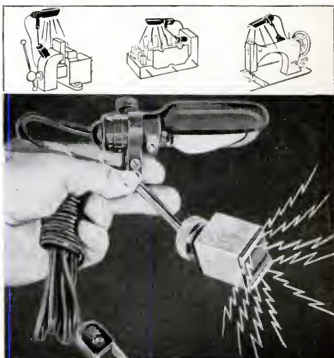
ROTATING CLAMP speeds up accurate positioning of small pieces to be welded at various angles. Unit consists of a U-shaped frame fitted with two clamps which can be rotated 360 deg. and locked at any angle. Enables the welder to work alone without the aid of a helper in the fabrication of intricate work. Each clamp is fitted with a V-grooved jaw so it will hold flat or round work



COMBINATION HANDSAW for carpenters is provided with features which make it useful as a framing square, protractor, rule and miter square for laying out all the commonly used angles between 90 and 45 deg. Back of the blade is straight and is graduated in eighths of an inch. There's a deeply etched protractor at the center of the blade and bevel plates attached to both sides of blade provide for angle layouts



PIN-POINT LIGHTING is easy with this portable light unit which is fitted with a permanent-magnet base that will attach itself to any metal surface, either flat or curved. Ball end of the bracket swivels in a knurled nut attached to magnet housing, enabling the user to adjust the unit to direct light onto the work in whatever manner desired. Finger-tightening the nut holds the lamp in any position. Socket and reflector are flock-finished for ease of handling. Socket has turn-button switch and takes 25-watt bulbs



Balanced Paint-Can Holder Hangs From Ladder Rung



The difficulty of holding a small can of paint when working on a ladder caused one painter to devise this holder. It consists merely of a length of 2 x 4 that was notched at an angle near one end, as shown, to hang from a ladder rung. A paint-can lid was nailed to the top of the holder to serve as a tray.

Thumbtacks Pulled With Film Spool

An empty spool for photograph film can be put to good use as a tool for removing thumbtacks from a drawing board. Just push one flange of the spool under the head of the tack and, using the spool as a lever, pry the tack upward.

Roughage Feeder Is Improvised By Use of Cultivator Wheels



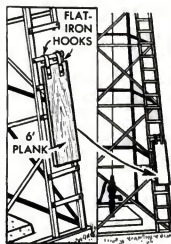
To solve the problem of feeding roughage to sheep and calves without waste, one farmer improvised a feeding rack from two discarded cultivator wheels, one being

8 to 10 in. larger in diameter than the other. The hubs were cut out and the spokes bent outward at right angles to the tire. The larger wheel was used for the top of the rack, the spokes of the upper wheel being welded to the upturned spokes of the lower one. Where there are an unequal number of spokes, two spokes are welded to one, forming a "Y." When made from wheels 36 and 48 in. in diameter, the unit will hold approximately one bale of hay.

A. M. Wettach, Mt. Pleasant, Iowa.

Children Kept Off Windmill

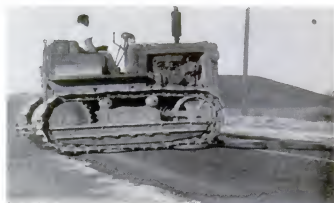
On some older-type windmills the ladder extends nearly to the bottom of the tower and is a potential danger to small youngsters who may be tempted to climb the tower. One farmer guards against this danger by hanging a 6-ft. length of 2 x 12-in. planking over the ladder as in the detail.



Two hooks made from flat steel were bolted to the top end of the plank so that it can be hooked over one of the ladder rungs. To discourage easy removal of the guard, the lower end of the plank can be wired to the ladder.

Tires Pad Highway for Tractor

Instead of carrying a heavy tractor belt to use for padding a highway against the treads of his crawler-type tractor, one California rancher found that eight old auto tires served the purpose just as well and were much easier to handle. The tires are laid in two rows, one row to accommodate each crawler tread, and the tractor is driven across the highway on top of them. When not in use, the tires can be left near the point where the highway is crossed for use in the future.



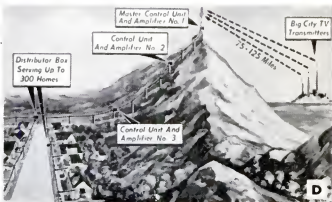
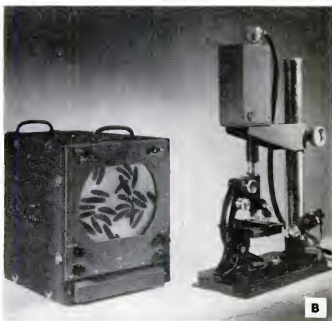
TELEVISION TODAY

CLEARER TV pictures, with greater contrast between light and dark areas, are foreseen with a new transparent screen for picture tubes being developed by General Electric. Tubes now used are opaque because they are coated with a powder which forms the picture. Appearing white or gray, this is the darkest that any shadows can be. With the new tube shown in photo A, clearer pictures are possible because dark areas can appear as black as the dark interior of the tube when installed in a set.

RCA industrial television equipment, when used with a light microscope, now provides a useful tool for educational purposes. As illustrated in photo B, the Vidicon TV camera is mounted above the microscope. The image is then reproduced on the 10-in. monitor tube at left, with a further electronic magnification of 20 times or more. The micro-organisms shown on the screen are paramecia.

Richard Pritchard, an architectural designer in Milwaukee, combines a remote-controlled TV receiver with a camouflaged picture-frame screen for the wall installation illustrated in photo C. A picture-size opening is cut into the house-wall interior and the set is installed behind it. The scenic picture moves in and out of place by means of an electrically operated mechanical push-button device.

Today, some communities that were cut off from television signals by hills or mountains are receiving TV programs by means of community antenna systems with coaxial cables running directly to homes, sketch D.



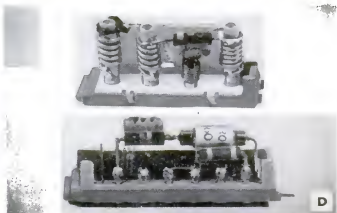
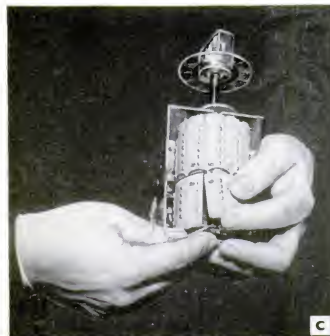
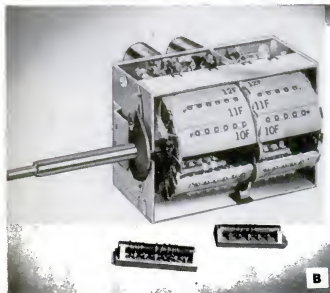
ULTRA-HIGH-FREQUENCY TV STATIONS

By Frank L. Brittin



WHEN ultra-high-frequency (UHF) telecasts are made available next year, you will have very little difficulty in tuning them in with your present TV receivers. No TV receivers now in use, or those being manufactured, will be made obsolete when the "1948 freeze" on television-station expansion is lifted. At the time the Federal Communications Commission halted applications for new TV stations because of a shortage of wave-length channels, the use of ultra-high frequencies was proposed to solve the expansion problem. These UHF bands will make television available to homes in all parts of the country. The present 12 very-high-frequency (VHF) television channels will remain in operation just as they are, on the same stations.

The UHF range employing channels between 470 and 890 megacycles offers the means for growth by providing for a total of about 2000 TV stations on the basis of TV allocations proposed by the F.C.C. on March 24, 1951. At the present time there are 107 VHF television stations in the United States, with a maximum of only 377 more possible in this old 12-channel VHF range. At the time of the freeze there was very little information available concerning the usefulness of the UHF frequencies for television broadcasting, although some propagation tests had been made. RCA inaugurated a full-scale field test, and the UHF transmitting station shown in photo F was built on Success Hill, two miles northeast of Bridgeport, Conn. This station, KC2XAK, which is operated by NBC, began experimental UHF TV transmissions in December 1949. UHF converters and tuners were installed in about 100 homes and check points in and near that city. A regular schedule of programs has since that time been relayed by microwave from NBC's New York station, WNBT, to Bridgeport. This was the first UHF station in the United States to operate on a regular



DUE IN 1952

schedule. The Bridgeport area has been used ever since by RCA and others as a testing ground for UHF receivers. The good results obtained brought about the proposed UHF television-channel allocations by F.C.C. in March 1951. The green light for lifting the freeze on TV-station expansion is due in the fall of 1952. The expansion program and the building of new TV stations will, of course, depend upon the availability of necessary materials.

Zenith was the first TV-set manufacturer to announce that it had made provision in the tuning units to take care of UHF channels when they were authorized. About 40 percent of all TV sets now in use employ the Standard Coil Products Company's tuner shown in photo B. These tuners accommodate the new UHF channels just as readily as they do the present VHF television channels by simply inserting the tuning strips shown in photo D, which will be available for any of the assigned UHF channels.

Photos A and C illustrate how easy it is to remove unused VHF channel strips with either a screwdriver or your fingernail. The new UHF strips, photo D, merely snap into position, and you will be ready to tune in your UHF television programs. In most TV sets, the tuner unit is located on the underside of the set chassis in the position indicated in photo A, which is the right-hand corner, facing front. Any TV serviceman can do this for you in a very few minutes, and experienced set owners may do it themselves.

Some TV-set manufacturers have designed UHF tuners and converters about the size of the TV booster units now in use in fringe areas. Anyone can connect them with a screwdriver, without any change or adjustment being necessary within the TV set itself.

In many installations, the available antenna arrangements will suffice; in others it may be desirable to add a small auxiliary TV antenna for the reception of the UHF





band. The "stacked vee" antenna that appears in photo E is a combination VHF-UHF antenna that has produced the best results in the Bridgeport area to date. Tubular-type twin-lead transmission line is employed with this antenna array. The writer recently attended a UHF demonstration in Bridgeport and vicinity. The reception test was made at Orange, Conn., some 15 miles north of Bridgeport. The regularly scheduled programs from WNBT in New York reached the Bridgeport station, KC2XAK, photo F, over a 2000-megacycle beam from a transmitter on the 85th floor of the Empire State Building. After the signals were picked up by a 6-ft. parabolic antenna located on the 180-ft. level

TV ALLOCATIONS BY STATES

State	Operating TV Stations		New Assignments	
	No.	VHF	No.	UHF
Alabama	2	8	37	
Arizona	1	14	15	
Arkansas		10	28	
California	11	30	50	
Colorado		10	26	
Connecticut	1	2	12	
Delaware	1	1	3	
Dist. of Columbia	4	4	2	
Florida	2	23	33	
Georgia	2	15	38	
Idaho		15	13	
Illinois	5	11	45	
Indiana	2	6	39	
Iowa	2	12	46	
Kansas		12	37	
Kentucky	2	5	27	
Louisiana	1	12	30	
Maine		9	20	
Maryland	3	3	9	
Massachusetts	2	4	19	
Michigan	6	17	48	
Minnesota	2	14	34	
Mississippi		8	31	
Missouri	2	17	36	
Montana		22	17	
Nebraska	2	13	21	
Nevada		14	8	
New Hampshire		2	10	
New Jersey	1	1	8	
New Mexico	1	15	20	
New York	13	16	39	
North Carolina	2	12	39	
North Dakota		16	17	
Ohio	12	13	44	
Oklahoma	2	11	43	
Oregon		11	21	
Pennsylvania	7	9	43	
Rhode Island	1	2	2	
South Carolina		7	20	
South Dakota		12	18	
Tennessee	2	13	38	
Texas	6	50	126	
Utah	2	9	10	
Vermont		1	9	
Virginia	2	8	29	
Washington	1	13	28	
West Virginia	1	6	17	
Wisconsin	1	9	35	
Wyoming		10	17	
Total	107	557	1357	

of the 250-ft. Success Hill tower, they were led downward to the receiving equipment in the transmitter building, processed there, and then retransmitted on KC2XAK's assigned UHF frequency of 529-535 megacycles. At the receiving point referred to, some 15 miles north of Bridgeport, an ordinary TV receiver equipped with the Standard tuner shown in photo B and UHF coil segments, photo D, gave a very convincing demonstration of what we can expect from UHF telecasts. Photo G shows the "snow-storm" effect obtained when the picture was received on the VHF channel; photo H is the same program when the set was switched to UHF from KC2XAK. These photos have not been retouched.

General Electric's new experimental 5-kilowatt UHF television transmitter at Electronics Park, Syracuse, N. Y., is shown in photo J. This station employs an improved type of UHF velocity modulation; the antenna is made up of four spiral sections like the one shown in photo I. Greatly increased radiated power is claimed.

A Low-Cost CW Transmitter For the New Novice Ham Band

By S. A. Johnson W0LBY

PART I

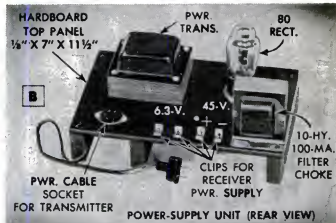
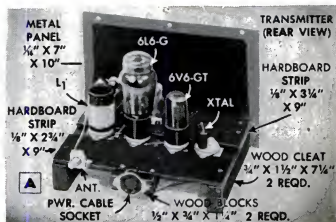


WHEN the newcomer in ham radio has passed his novice examination and received his operating ticket, the next step is to build a simple transmitter that will operate in the 3700 to 3750 kilocycle (80-meter) CW novice band recently set aside for beginners. Like the novice-band receiver described in the September issue, the transmitter is built up on hardboard bases supported with wooden cleats in order to simplify construction and keep down cost. The transmitter-unit base is divided into two panels spaced the width of the tube sockets so that all sockets may be mounted without the necessity of drilling large mounting holes.

On the underside of the transmitter unit,

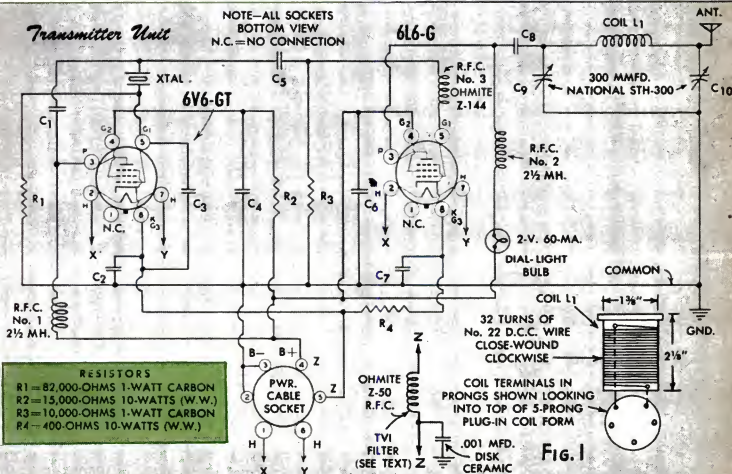
FIXED CONDENSERS FOR TRANSMITTER UNIT

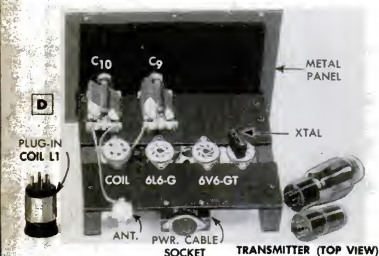
- C1—.001 mfd. 500-V. mica type
- C2—.001 mfd. 500-V. disk-ceramic type
- C3—.0001 mfd. 500-V. mica type
- C4—.01 mfd. 500-V. disk-ceramic type
- C5—.0001 mfd. 500-V. mica type
- C6—.01 mfd. 500-V. disk-ceramic type
- C7—.01 mfd. 500-V. disk-ceramic type
- C8—.001 mfd. 500-V. mica type



Transmitter Unit

NOTE—ALL SOCKETS
BOTTOM VIEW
N.C.=NO CONNECTION





the cleats are notched at front so that this unit can be fitted into a standard-size metal cabinet if this is necessary in order to reduce interference with a near-by television receiver. Actually, because the power is low, and the frequency of operation is also low, the metal cabinet is seldom required. The transmitter is crystal-controlled and uses a 6V6-GT or 6V6 oscillator tube, although a 6F6 can be substituted without circuit changes. The oscillator is followed by a 6L6-G (or 6L6) amplifier tube. This amplifier includes a "pi" network which makes it easy to couple the transmitter to the antenna.

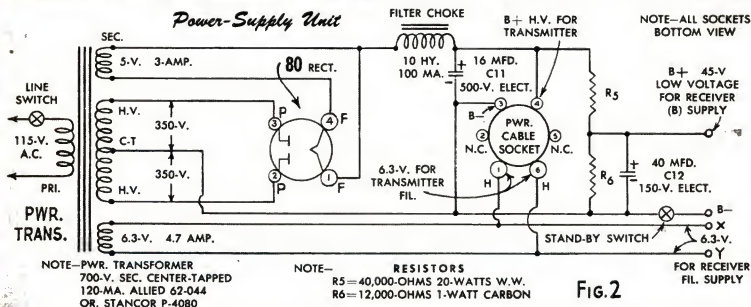
The power for the transmitter is obtained from the separate power-supply unit and is fed in through a 6-prong socket and plug-in cable arrangement. The socket shown on the rear of the chassis in photo A is mounted on two small pieces of wood. This places the socket in position to fit a hole cut in the rear of the cabinet, if one is used.

In wiring the transmitter, the first step is to provide a common-ground strip, or bus bar, of 14-gauge bare copper wire. This is run between two dead pins on the coil socket for L1 and crystal socket respectively. Photos A, C, D and F show various views of the transmitter; photos C and E show it housed in a cabinet. The schematic circuit diagram for the transmitter appears in Fig. 1, and the diagram for the power-supply unit is given in Fig. 2. Photos B and G show top and bottom views of the power unit.

The crystal selected for the transmitter should have some frequency between 3700 and 3750 kilocycles. It is a good idea to buy a crystal which is well within the band. To make an expensive meter unnecessary, a 60 ma., 2-volt dial-light bulb is connected in series with the B-plus lead to the amplifier stage of the transmitter. The bulb

(Continued to page 236)

Power-Supply Unit



Johnny Lujack SAYS

"I add water
only 3 times
a year"

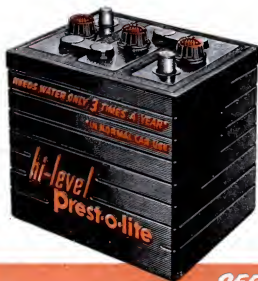
PREST-O-LITE HI-LEVEL BATTERY...



Johnny Lujack, outstanding passing and running quarterback for the Chicago Bears professional football team, finds Prest-O-Lite Hi-Level has over 3 times the liquid reserve of ordinary batteries—goes 3 times as long without adding water.

needs water only 3 times a year

IN NORMAL CAR USE



INSTALL a Prest-O-Lite Hi-Level Battery in your car and enjoy the comfort and convenience of this new principle of battery design. The Hi-Level Battery needs water only 3 times a year in normal car use and because of its advanced engineering design, it lasts longer, in tests conducted according to accepted life cycle standards. For quick starts and dependable service, see your Prest-O-Lite Dealer.

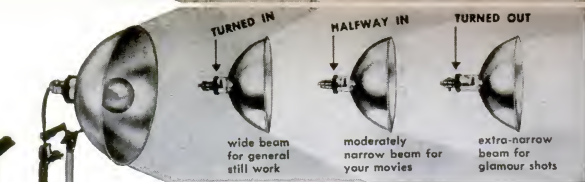
PREST-O-LITE BATTERY COMPANY, INC.

Toledo 1

Ohio

SEE YOUR PREST-O-LITE DEALER TODAY

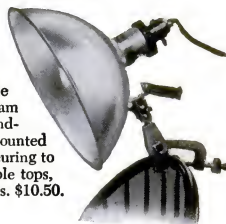
Bring the Sun Indoors



FLOODS help make superb indoor pictures

Kodak Vari-Beam Standlight—You get powerful, controlled illumination with 12-in. reflector, No. 2 flood lamp. Easy aiming with convenient handle. Column adjusts from 3 to 5½ ft. Rubber rim on base protects furniture. \$16.

Kodak Vari-Beam Clampight—has the same controlled beam features of the Standlight Unit, but is mounted on a bracket for securing to backs of chairs, table tops, and tubular surfaces. \$10.50.



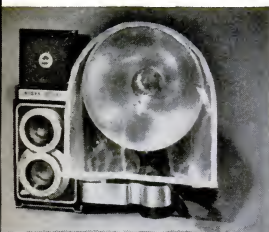
for some of the best snapshot opportunities

Some of the best picture-taking situations happen indoors—*right inside your family circle!* The Kodak lighting equipment shown on this page will help you capture those shots whenever you want. Maybe it's an informal one of "Sis" in her first evening dress. FLOODS are the answer, of course. Or maybe it's baby playing in his bath. What

easier way to catch all the fun than with FLASH!

Practically every camera, new or old, can be adapted to indoor picture taking. Your Kodak dealer will be glad to show you all the latest equipment. *Make it a point to see him soon.*

FLASH helps catch those wonderful candids



Kodak Flashholder, Model B—fits most cameras with flash shutters. 2-way Flashguard offers protection in case lamp shatters... produces soft illumination for indoor color shots. Price, complete, \$12.35.



Kodak Flashholder Extension Unit, Model B—connects to Flashholder on camera, gives you multi-unit illumination for more natural-looking flash pictures. Attach to flat or tubular surface. \$13.65.



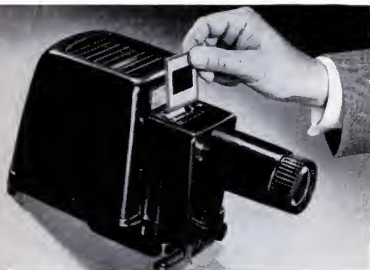
Kodak B-C Flashpack—dependable "flash." Use in place of two "C" batteries in flash unit. 22½-volt battery in Flashpack charges condenser for abundant energy to ignite lamp. \$2.95 (without battery).

Color...one of the biggest thrills of all



The beautiful projected image in full color is one of the most satisfying rewards of taking pictures with Kodachrome Film. Here you see some of the latest Kodak equipment and accessories for projecting, viewing, and storing Kodachrome slides.

Your dealer's experience and advice can prove invaluable. Don't hesitate to ask him questions. Answering them is his business. Enjoy one of the biggest thrills of all in photography—*pictures in color!* See your Kodak dealer today.



New, low-priced slide projector—Kodaslide® Merit Projector is big news because of its new, improved slide-feeding mechanism. You simply insert slides in *top* of projector—thus no jarring or moving of instrument. Cool, large-sized lamphouse of unique design to keep slides flat... built-in elevating mechanism... Lumenized Kodak Projection Ektanon Lens, 5-inch *f*/3.5... powerful 150-watt lamp... *all add up to real value for only \$24.50.*

For convenient showings to small groups—

Kodaslide Table Viewer, 4X, combines projector and screen in one unit. Think of the convenience—a complete show right in front of you—no rearranging of furniture, no dimming of lights. Switch it on and you're ready for a color show. You see your color slides beautifully enlarged more than 4 times. \$49.50. Accessory carrying case at a small extra charge.



Keep slides protected, organized—Kodaslide File Box is a sturdy metal box that holds 150 cardboard slides or 55 glass slides. Separators for group filing. \$1.50.



12 swing-out compartments in the de luxe Kodaslide Compartment File hold 240 cardboard or 96 glass slides. You'll like the handy index inside the cover for listing slides by subject. \$3.75.

Prices subject to change without notice and include Federal Tax where applicable. Consult your dealer.

EASTMAN KODAK COMPANY, ROCHESTER 4, N. Y.

Kodak
TRADE-MARK



Care and Feeding of Engines

BY S. P. CORP

WHEN BRAKES DON'T BRAKE

You're rolling merrily along. There's a stop sign ahead, for a main highway. You put your foot on the brakes. Nothing happens. For a few sickening seconds you go along with your heart in your mouth. You pray there isn't a car coming. There isn't. But there might just as well have been.

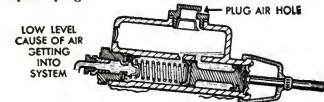
To keep this from happening, check your brakes often. Watch the position of the brake pedal when you stop quickly. If the under side of the pedal is less than 1½ to 2 inches from the floor, your brakes need adjusting. If you have to "pump brakes" to stop, your brakes need adjusting. Adjust the shoe of each brake.



AIR IN SYSTEM

Even after brakes are adjusted, you may have stopping trouble. If the pedal feels spongy or soft as you step on it, you probably have air in the hydraulic system. Check for air in the system by applying the brake with the car stopped. Hold the pedal down for a few seconds, then apply a little more pressure. If it moves down again, or feels spongy, you have air in the system, which must be removed by a bleeding operation at any good service station. Air gets in when brake fluid gets too low in the master cylinder. Check this level

often, by cleaning top of cylinder and removing plug. If fluid is lower than ½ inch below top of cylinder, add fluid. See that air hole in plug is clean, then replace plug.



IF YOUR CAR SMOKES TOO MUCH

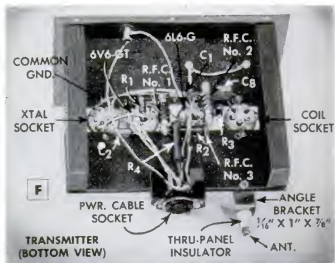


A smoking exhaust means your engine is wasting gas and oil, and needs new Sealed Power Piston Rings. The Sealed Power MD-50 is the best steel oil ring ever made. It controls oil even in badly tapered and out-of-round bores. Your dealer has Sealed Power Rings or can get them for you. A postal to Sealed Power, Dept. G-10, Muskegon, Mich., will bring you free helpful book, "7 Ways to Save Oil."

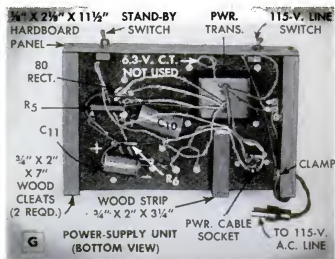
Low-Cost CW Transmitter

(Continued from page 232)

glows as the amplifier stage is coupled to the antenna for final tuning. The transmitter key is of standard type mounted on a small base. It connects to the separate pair of cable leads in the 6-prong plug that goes



in the 6-prong power-cable socket in the rear of the transmitter chassis. This separate pair of key leads connects to socket terminals 2 and 5 in this transmitter power-cable socket. The other two pairs of leads in the cable supply the heater and B-voltage to the transmitter. These cable leads may be ordinary rubber-covered 2-conductor lamp cord, all about 3 ft. long. If the



TV filter shown in Fig. 1 is required, it should be connected right at the power-plug socket at the points indicated by the letter Z in diagram Fig. 1.

Antenna-construction details, and tuning instructions for putting this novice-band station on the air, will appear in a concluding article in the November issue. Detailed student material list R-404 for this CW transmitter is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.

LOOK TO LIONEL TRAINS FOR THE REAL THING

Advanced engineering...
exclusive features...
most realistic design and
performance in 50
years of Model rail-
roading.



Compare looks
and performance.
Only Lionel gives you
true railroad perfection.

More than fifty years of engineering
are behind these great LIONEL TRAINS
... pioneering... inventing sensational new
features. Lionel was first with trains that puff
real smoke... whistle by remote control.
Lionel stepped even farther ahead with the
only real R.R. remote-control knuckle cou-
plers, and exclusive Magne-Traction*. You
get the World's Finest when you get LIONEL
trains. Free catalogue at your dealer's... or
send coupon for special offer.

*available in all "0" gauge sets and in most "027" sets

**FUN
for
ALL**



**Hear...Bells...Horns
whistles on this Rail-
Road sound effect record**

**SEE all the LIONEL TRAINS
and accessories in
the new catalog**

ALL FOR ONLY 25¢

MAGNE-TRACTION

Lionel locos with Magne-Traction climb grades where others can't even start. Add mountains and curves to layouts never before possible. This Lionel development increases train speed, pull, climb, and control. A permanent Magnetic grip through truck and wheels does it. A Lionel exclusive.



Lionel loco speeds up steep grade with magnetic track-holding power more efficient than deadweight.

Real R.R. Knuckle Type Couplers



Remote control button uncouples cars instantly. Cars couple automatically when brought together. Only Lionel has this remote control, electro-magnetic coupler. It's designed after A.R.A. Knuckle Couplers that are standard on American railroads.



Smoke

Clean, white smoke puffs
with action of drivers.

Whistles

Two-toned built into tender
— real R.R. pitch — remote-
control operation.



**Die Cast Trucks
Solid Steel Wheels**

Special Coupon Offer

LIONEL TRAINS, P. O. Box 354,
Madison Square Station, New York, N. Y.
Please send me special Lionel Train catalog offer, postage pre-
paid. I enclose 25¢ to cover postage and packing.

1. The new 36-page full-color Lionel catalog.
2. The new 5 1/2" double-faced record* of whistles, bells, railroad sound effects and Diesel horns.
3. 10 full-color miniature billboards.

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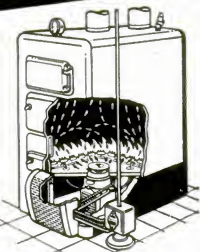
City _____ State _____

*Plays on all 78 RPM phonographs except some spindle or automatic changers.

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Here's Why!

As any housewife knows

indirect heating as shown



at left

takes longer than

direct heating action.



● The tea kettle experiment above clearly demonstrates the secret of TORIDHEET's amazing heating efficiency. Unlike conventional oil burners, TORIDHEET's flames actually *contact* the walls of the combustion chamber, communicating their tremendous heat *directly* to the surfaces which heat the water or air. This *direct action* assures maximum heat from your fuel—quickly, economically. Complete Furnaces or Conversion Burners.

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Cleveland 2, Ohio

Please send me complete facts on the TORIDHEET
Rotary burner with direct heating action

Name _____

Address _____

City _____ Zone _____ State _____

Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



Termite Infestation?

Q — I have an old carriage barn on my property which I use as a garage. The second floor is supported on beams and recently I noticed that several of the beams are perforated with small holes about the size of a pencil lead. I also noted small piles of wood dust on the floor under the affected beams in an unused part of the building. Is this the work of termites and, if so, what can I do about the situation? S.U., Pa.

A—If we judge correctly from your description, it is not likely that the building is infested with termites. Rather we would suspect that the trouble is caused by what are commonly known as powder-post beetles. However, these pests can cause serious damage in a comparatively short time and getting rid of them is not always simple. One fairly reliable method of extermination is to drill a row of small holes a little over halfway through the affected beam from the top, spacing the holes about 4 in. apart and drilling right through the floor boards. Use a 1/8-in. drill bit. Then fill the holes with a half-and-half mixture of creosote and kerosene, or thin mineral oil. As the solution soaks into the wood, refill the holes. Eventually the creosote solution will penetrate the sectional area of the beam along its length in that portion where the holes have been drilled. Another method is to force the solution into the small holes made by the insects with a pressure-type oil gun. It may be necessary to enlarge the holes with a small drill so that the tapered nozzle of the gun can be inserted. Similar methods can be used in exterminating carpenter ants which sometimes attack the framing members of old buildings.

Insulating Water Pipes

Q—We have a basementless home with a crawl space under the floor. Water in pipes under the floor froze last winter causing some damage and now we are wondering how to prevent this during the coming winter. Isn't there some type of insulating material made for this purpose? C.R., N.Y.

A—Yes. It's a special insulating cover of asbestos cemented over layers of asphalt-impregnated wool felt and is effective in preventing condensation on the pipes in summer and freezing of the water in the pipes in winter. It comes in sections and in applying it on the straight runs of pipe care must be taken that joints between the sections are sealed to

(Continued to page 240)



INSTALL **MATICO** YOURSELF
for as little as **13¢** a sq. ft.

**SO EASY!
YOU LAY IT
TILE BY TILE**



**Create exclusive designs from
unlimited color combinations!**

Beat high flooring costs! Install MATICO yourself! You can floor an entire room in only a few spare-time hours. MATICO offers everything you need—simplified instructions . . . special tool kit . . . and tile so outstanding in color richness, finish and durability that it is ideal for every room in your home. Superior MATICO resists scuffs and mars . . . washes easily . . . gleams like new with occasional no-rub waxings . . . wears for years and years . . . and comes in 27 rich colors, including lovely pastel "Petal Tones." Colors and marbling can't wear off — they go clear through each tile. Ask your dealer for details or mail coupon today!

**Your cost may be less, or slightly more, depending on where you live, and the colors you select.*



**MASTIC TILE CORPORATION
OF AMERICA**

Member Asphalt Tile Institute
Factories:

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*For faster cleaning . . . more beautiful asphalt tile
floors, always use MA-TI-CO Wax and MA-TI-CO
Cleaner.*

New, perfected
MA-TI-CO
install-it-yourself
METHOD
makes anyone a
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**Mail Coupon for
instruction booklet
NOW!**



**MASTIC TILE CORP. OF AMERICA
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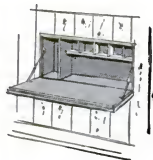
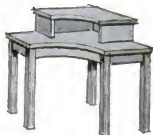
Please send complete install-it-yourself instruction kit, illustrated literature and color charts. Enclosed is 10c to cover mailing.

NAME

ADDRESS

CITY..... ZONE.... STATE.....

make these for CHRISTMAS!



with beautiful, easy-to-work WESTERN PINES*

Here are gifts they'll treasure for a lifetime . . . a satiny-surfaced corner table, an attractive bookcase, teatime furniture set for the youngsters, a built-in pull-down desk for daughter's room . . . all made of lovely-to-look-at, easy-to-work Western Pines.*

You can make these between now and Christmas if you get started soon! Send today for *Free Idea Packet No. 312*, which includes instruction sheets for these and other handsome workshop projects. The woods of the Western Pines* are light, easy to nail and shape, and finish up beautifully. And their straight, even grain, luxurious texture and distinctive appearance add beauty to the most simple article.

Use these inspiring Western Pines* to build in charm in halls and dining room, to reclaim idle space for dens and bunk bedrooms, or to remodel a kitchen. New, colorful booklet, "Enchanting Homes of Western Pines," has 71 photographs suggesting ways to use these versatile woods. Write Western Pine Association, Dept. 312-N, Yeon Bldg., Portland 4, Oregon.

These are the Western Pines

- *IDAHO WHITE PINE
- *PONDEROSA PINE
- *SUGAR PINE

(Continued from page 238)

prevent air gaps. Exposed joints, curved sections, elbows and connections in the pipe lines must be protected by wrapping with fine wire mesh and covering with asbestos cement, or similar insulating material, which is preformed to fit elbow and other curved parts.

Sweating Floor

Q—What causes the concrete floor in my house to sweat? Water collects in low places on the floor and is causing damage to rugs and furniture. The floor is laid on the ground over a cinder fill and was smooth-troweled and covered with asphalt tile in two rooms. The tiles are wet near the walls most of the time. What could cause water to come through the floor? O.T., Okla.



A—As a rule the water does not come through the floor, but rather from the air in the rooms. The floor is colder than the air and for this reason moisture condenses on the cold surface just as it does on a glass tumbler filled with cold water. Unfortunately, your problem has no simple, inexpensive solution. Approved practice requires that floors in contact with the ground should be poured over a tamped-gravel fill and in addition should be provided with an insulating membrane. The latter serves a twofold purpose in that it prevents any possibility of water coming through the floor from below and also tends to equalize the temperature at the surface of the floor with that of the air in the rooms. This prevents condensation of moisture on the floor. Of course, it is not always practical to make such an installation in homes already built. Although ventilation in itself is not a cure for the condensation problem, many homeowners have found that a kitchen ventilating fan operated at intervals during the day has minimized condensation to such an extent that it is no longer troublesome. The fan should have a capacity of approximately 250 cu. ft. of air per minute.

Painted Outdoor Furniture

Q—Recently we built a picnic table and benches and finished the units with two coats of paint. Now, after only one season's use, the paint is peeling in spots on both the top and bottom sides of the boards and on the table and bench legs near the lower ends. The units are made of pine, 2x4s for the frame and 1½-in. stock for the top. What can we do to prevent this trouble? T.P., Mich.



A—We think it quite likely that the wood contained a high percentage of moisture at the time the paint was applied. A less common cause of peeling paint is the presence of excessive resins and other gums in the wood but usually, in this case, only individual boards are affected. If we understand your description correctly, we believe it will be necessary to remove all the peeling paint and refinish completely. This is easily done with a paint remover. After removing the paint, sand the bare wood thoroughly and apply a primer of the type used on exposed woodwork. After applying the primer and allowing it to dry thoroughly, apply paste white lead to the open grain at the lower ends of the legs. White lead forced into the open grain at these points with a putty knife will prevent the entrance of moisture when the end of the leg is in contact with damp ground. Finish the job with two coats of oil-base paint.

Here's Solid Evidence That

CHAMPION

SPARK PLUGS

Are Better For
Your Car



Never before has America's need for dependable transportation been so great—in both military and civilian service. And never before have Champion Spark Plugs been in such great demand because of their reputation for economy, power and long life.

Quality products are always first choice—and Champions have been America's favorite for over 25 consecutive years!

CHAMPION SPARK PLUG COMPANY, TOLEDO 1, OHIO

Listen to the CHAMPION ROLL CALL . . . Harry Wismer's fast sportscast every Friday night, over the ABC network

OCTOBER 1951

241

You'll do better work with better tools

There's one point on which all mechanics agree—better tools mean better work. That's why you'll see these Stanley Tools in the tool chests of skilled woodworkers everywhere. Accuracy and easy driving action make these tools perfect partners for better boring. Buy where you see the famous Stanley trade mark. It's your assurance of better tools.



No. 610 Hand Drill.
New! Enclosed gears for safety. Drills holes easier and faster to full $\frac{3}{4}$ " capacity.



No. 59 Doweling Jig
For boring holes accurately and easily in the edge, end or surface of boards. Furnished with depth gauge and six guides — $\frac{1}{8}$ ", $\frac{1}{4}$ ", $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ".



No. 923 Bit Brace.
New self-centering chuck. Forged Universal jaws hold straight shank bits and drills from $\frac{1}{8}$ " to $\frac{3}{4}$ ", all sizes auger bits.



NEW Series C Early American Designs

Set of 15 plans **25¢**
Fun to make — easy to follow.
Tear off this coupon and mail.

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| Jewel Box | Corner Shelves |
| Smoker's Wall Rack | Miniature Cobbler's Bench |
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| (Five other selected projects) | |

Stanley Tools
New Britain, Conn.
The Tool Box of the World



Reg. U.S. Pat. Off.

HARDWARE • TOOLS
ELECTRIC TOOLS
STEEL STRAPPING • STEEL

SEND ME SERIES C

Stanley Tools, 3101 Elm St., New Britain, Conn.
(In Canada: Stanley Tool Co. of Canada, Ltd., 3101 Stanley St., Roxton Pond, Quebec).

I want () Series C Early American Designs.
Enclosed is 25¢ for each set.

Name.....

Street.....

City..... State.....

The New West Still Fights Rustlers

(Continued from page 95)

proportion to cattle handled. Last year, the Idaho brand inspectors checked on more than 800,000 head of cattle with about 5000 different brands.

All cattle are checked before being sold to determine proof of ownership. If there is doubt, they can be impounded without danger of liability to the brand inspector.

Idaho law requires branding of cattle or presentation of notarized evidence of ownership before butchering. Both hides and meat are tagged to show the animal was branded before slaughter or that ownership had been properly established.

Due to the fact that there are so many different herds nowadays, ranchers in most Western states are experiencing trouble thinking up new and different brands.

Commented C. F. Adams, Washington state brand inspector:

"Small circles or intricate designs just make a blur that no one can read. The simpler the brand the better."

Adams indicated his brand book, then added, "Some of these brands are just plain no good."

Some states allow three or four persons in different parts of the state to use the same brand. In Texas, cattlemen have even used pictures. One applicant who registered on St. Patrick's day selected the shamrock. Another cattleman, filing his brand on Washington's birthday, chose a hatchet.

Experienced brand inspectors usually know several hundred brands on sight, and can quickly spot any alteration. Alfred Martin of Salina, Utah, who has been a brand inspector in that state for 35 years, can tell you the owners of more than 800 brands without ever opening the state brand book.

Last winter, Martin squinted at a couple of calves sold in Sanpete County. Hair had grown heavy over the brands, but Martin read them right through the hair. Those calves, Martin knew, didn't belong to the owners listed on the bill of sale. Belonged to a rancher over Redmond way. The sheriff picked up the two men who had rustled the calves.

Brand inspectors, county sheriffs and state patrolmen work closely together. In some areas, however, there just aren't enough law men to go around.

In Oklahoma recently, angry ranchers threatened to take rifles off the wall and form vigilante committees to patrol country roads. Sheriff Raford Scott of Blaine County in Oklahoma said that rustling in

(Continued to page 244)



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CORALOX
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**SPARK
PLUGS**

If You Own a
PONTIAC...

*AC Spark Plugs, with
patented CORALOX Insulator,
Were Engineered Especially for You*

For many years, Pontiac engineers have looked to AC for spark plugs which perform perfectly in Pontiac six- and eight-cylinder engines, under all operating conditions.

Naturally, the plugs they specify for all Pontiac engines are the newest AC Spark Plugs, with patented CORALOX Insulator.

CORALOX contributes to driving pleasure by making spark plugs perform better and live longer. It greatly resists fouling. Consequently, it ensures easier starting and surer firing, whether the engine is hot or cold.

CORALOX brings these advantages to owners of *all* Pontiac cars, past models as well as present.

AC Spark Plugs, with patented CORALOX Insulator, are therefore the logical replacement plugs for all Pontiac owners who want the utmost in spark plug performance.



IF YOUR CAR ISN'T A PONTIAC

you can also have the superior performance ensured by CORALOX. AC's immense engineering staff has worked with the engineers of most engines built in America. Therefore, there is an AC Spark Plug type, with patented CORALOX Insulator, engineered for your engine, too.



AC SPARK PLUG DIVISION

GENERAL MOTORS CORPORATION

OCTOBER 1951

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Reset loose drawer pulls—

Replaces splintered wood . . . makes loose screws firm!



Seal drafty cracks—

Fills openings easily . . . dries tight and hard! Resists weather!

Repair loose tiles—

Holds tiles firm on wall! Easy!



Also useful in filling cracks in floors, nail and screw holes, repairing broken toys. Handles like putty . . . hardens into wood!



A CELLULOSE FIBRE FILLER

IN CANS OR TUBES



WEATHER RESISTANT

his county was the worst since he first pinned on his star more than 16 years ago. Carl Cannon, brand inspector of the Texas and Southwestern Cattle Raisers' Association, estimated that more than 300 rustlers were operating in Oklahoma.

He said that one rustler was apprehended stealing cattle coming and going. He would rustle a truck load of choice beeves, race 300 miles across country, and sell them. Not inclined to wheel an empty truck back, he would then rustle more cattle, and collect on these at a home market.

Like Shaw, Cannon stressed the importance of branding.

"We can usually track down stolen cattle if they are branded and appear at a market," he said. "Just to show you how it works, 11 head of cattle were stolen from a Seiling sales barn recently. Only one two-year-old white-faced heifer was branded, but that was enough.

"We found the heifer at the Oklahoma City market, and began tracing its sales. That heifer had been sold and resold five times before it finally got to Oklahoma City. We caught the rustler after checking records at the first sale."

Generally, the law men feel that they can curb rustling if they can get full cooperation from the ranchers in checking on their own stock. One of the most cooperating ranchers is Gerhard Scheer of Wood Lake, Neb. In 1937, he lost a small fortune on the hoof to rustlers—126 cows and 70 calves. Next year, the take of the cattle thieves was 30 head. Plenty sore by that time, Scheer bought an airplane, and proceeded to ride herd over his 20,000-acre ranch from the sky. He hasn't even lost a calf since.

Air Support Is the G.I.'s "Sunday Punch"

(Continued from page 85)

suspicious tracks leading into the woods. That is complete confirmation of the estimate made the night before, and the pilot goes to work with rockets and bombs.

The Air Force used piston-engine aircraft as well as jets in Korea, but the indications point to use of jets exclusively as soon as new production is available. One of the newest, the Republic F-84F Thunderjet, carries eighteen 5-inch rockets plus two 1000-pound bombs. One version of the Lockheed F-80 carries half a dozen napalm tanks under its wing.

The Navy is testing both jets and piston aircraft for close support and the Marines so far are committed to piston-engine aircraft alone. The Marines say their air-

(Continued to page 246)

Imagine! An 8-inch Tilting-Arbor Saw with ball bearings selling for less than \$50⁰⁰



Table ALWAYS level. Work lies flat regardless of angle of cut

Saw only **\$46.95*** CASH
Without motor, extensions, bench
Only \$5.00 Down on Easy Terms
Complete Outfit as shown
\$103.95* With motor, CASH pulley, belt, side table extensions, bench.
Only \$10.50 Down

Only Sears offers you an 8-in. Bench Saw with these 5 important features at anywhere near this low price . . .

1. Precision ball bearings—sealed and lubricated for life.
2. 8-inch blade—the most popular size!
3. The tilting arbor feature—blade tilts instead of the table!
4. One lever locks fence at BOTH the front and the back!
5. Grid type side extensions!

DUNLAP 8-inch Tilting-Arbor Bench Saw

IMPORTANT—don't confuse this great tool with other tilting-arbor saws selling in this price range. This DUNLAP 8-inch Bench Saw is far superior. Its rugged quality and exceptional accuracy in operation are almost unbelievable! At this amazingly low price it is truly a sensational power tool value . . . one of the best we've ever offered!

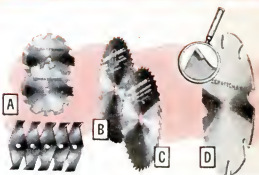
Flooring-drive motor mounting supports motor on a special mount on bench behind saw . . . smoothes vibration . . . permits easier tilting . . . and eliminates need for a separate motor. (Just slip the belt off, pick up the motor, and use it on other power tools with our regular motor rail clips.)

Super-lubricated sealed precision ball bearings have larger oil chambers than are usually used—NEVER need further lubrication. These double-row ball bearings form integral unit with arbor shaft and prevent misalignment.

Greatly improved fence design. Fence squares directly against front of table instead of usual guide bar, for accuracy. Can be used on either side of blade. Easily removed if desired.

17x14-inch table of cast semi-steel has top AND sides machined. 8-in. combination blade (1/2-in. bore) gives up to 2 1/4-in. depth of cut; tilts any angle up to 45°. NOT a stripped model—complete with blade, guard, splitter, miter gauge, fence and machine pulley. (Use minimum of 1/2-H.P. motor; 3450 R.P.M. with 2 1/2 in. pulley, 40-in. belt; or 1750 R.P.M. with 5-in. pulley, 44-in. belt.)

- *Prices slightly higher south of the Ohio and west of the Mississippi rivers.
- Buy your bench saw NOW . . . use Sears Easy Terms!
- See this DUNLAP Saw today at your nearest Sears Retail Store.



Useful Accessories

- A CRAFTSMAN 6-in. Dado Set.** Our finest professional quality. For dadoing, rabbeting, grooving, etc. Tempered high carbon steel. 1/2 or 5/8-in. center hole. **\$9.50**
- B CRAFTSMAN 8-in. Nail-Cutting Blade.** For crosscutting and ripping. High carbon saw steel. 1/2 or 5/8-in. arbor. **\$4.95**
- C CRAFTSMAN 8-in. Combination Saw.** For crosscutting and ripping. Chrome-nickel alloy steel. 1/2 or 5/8-in. arbor. **\$2.49**
- D CRAFTSMAN 8-in. Carbide-tipped Blade.** Lasts 20 times longer than ordinary circular saw blades. For ripping, crosscutting, mitering. 1/2 or 5/8-in. arbor. **\$12.95**

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Famous for fine quality . . . precision performance . . . low price!

New improved woodworking calculator

answers countless questions
in seconds... speeds jobs!



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GREENLEE Calculator with
more information on
lumber, nails, concrete mixes,
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venient... simple to read. Just set
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planes are unmatched in the ability to carry a load and to remain in the air, on call, for a long time. Their Douglas AD Skyraider, for instance, can pack a dozen 5-inch rockets, a pair of 11.75-inch Tiny Tim rockets and a 2000-pound aerial torpedo in addition to machine guns and cannon and can remain on station in the air long enough for making repeated strikes. A jet airplane that consumes a hundred pounds of fuel a minute can't compete with anything like that, they say.

In the long run the jets will win this argument. They are being improved month by month and the latest versions can stay in the air longer with heavier loads than the jets of only a year ago. The Air Force points out that only a jet can fight another jet successfully and that even in Korea enemy jet aircraft can be expected to get through our cover occasionally.

Today, new tactics for close-support aircraft are being worked out to make them even deadlier than now. They can't do all the fighting for the ground forces, of course, and in any well-organized action they play only a part along with tanks, artillery and other special-purpose weapons. You could build possibly a dozen tanks or a hundred field guns for the cost of one close-support aircraft and yet, from the standpoint of American lives, the airplane is about the cheapest weapon we have.



Magnetic-Tape Office Recorder

Office dictation is recorded on magnetic tape by a new instrument that can be re-loaded within a few seconds. The tape is permanently installed in a magazine. When a half-hour's dictation has been recorded, the operator merely inserts a new magazine.

An extra 20 miles on every tankful of gasoline you buy

If you're interested in getting an average of 20 extra miles — yes, 20 extra miles — on every tankful of gasoline, you'll be interested in the following facts:

At 40 miles an hour on a smooth, level highway, half of your gasoline — 50% of it — is used up just to overcome engine friction. That's what the automotive engineers have found. And that's why it's so important for you to realize that if you can *reduce* engine friction, you're bound to get better gas mileage.

You see, by reducing friction, you simply release *some* of the power that was being used to overcome it. So naturally your car goes faster or farther or climbs a steeper hill on the *same amount of gasoline*.

Let's examine the facts!

Hundreds upon hundreds of cars like yours were scientifically tested on a Dynamometer — the industry's accepted measure of power. The results show that the average motorist got 8% more power from the same amount of gasoline after he had changed from whatever brand of oil he had been using to Macmillan Ring-Free Motor Oil.

The minute you change to Macmillan, you'll get an increase in power and gasoline mileage. You cut down on "drag" — your gasoline "pushes" easier than before. After the second or third drain, the average motorist gets an increase in gasoline mileage of 8%!

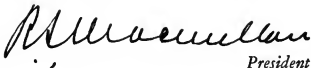
That's because Macmillan has not only

reduced engine friction but also has reduced carbon and gum deposits in the combustion chamber, on rings, valves, and valve stems. This results in higher compression because of better piston seal — smoother operation, and less tendency for the motor to ping.

Let's see what 8% means to you. 8% of 25¢ a gallon for gasoline is a 2¢ saving on every gallon you buy! Or, if you're now getting average mileage, an 8% *increase* means an *extra* 20 miles from every tankful.

And don't forget the long-range saving — it's friction that wears out motors. With Macmillan, you *reduce* friction — you save on wear and repair — your motor lasts longer, runs sweeter, uses less oil. New engines stay newer longer.

You'll find Macmillan — the original carbon-removing oil — at car dealers, garages, and independent service stations where you see the sign of the big red "M." Drive in, try Macmillan, the *OIL* that makes your *GAS* go farther.



President

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P.S. If you are unable to locate a Macmillan dealer, write to me and I'll be glad to direct you to the one nearest you. R.S.M.



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For "natural wood" finishes on furniture, panelling or woodwork, there's nothing like Satinlac. Brings out natural grain and color beauty of any plywood or solid wood. Avoids that "built-up" look; will not turn yellow or darken with age. "Water-clear," easy to brush or spray, dries faster for next coat in 2 or 3 hours.

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Send me free leaflets on Weldwood Glue, Firzite
and Satinlac.

NAME

ADDRESS

Plant Models Help Canada Fight Pests

(Continued from page 120)

model must correspond exactly in every last blotch, scale, scar or bruise. Good-quality artists' oil paints are used, thinned down with a solvent of 50-percent carbon tetrachloride and turpentine—or with gasoline, when no gloss is desired. The paint adheres readily to the wax.

Leaves are sometimes made by the wax process, with cotton batting for reinforcement. But most leaves are now made by the "celluloid" process, which Wood studied at Chicago Natural History Museum. Cellulose nitrate is dissolved in amyl acetate, and oil paint added for coloring. A single tobacco leaf, for instance, requires four different shades of green.

The plaster or latex mold is coated with glue—a sizing not affected by the cellulose solvent, which is painted directly upon it. One layer is laid over another to build up the thickness of the leaf, while retaining translucency. Because of variation in color, trial molds must be made of practically everything. When the leaf is complete—perhaps a corn leaf a yard long—the mold is soaked in water to dissolve the glue and release the hardened celluloid.

Leaf stems of Monel metal are incorporated in the model. The wire is dipped in nitric acid, which eats away the metal to produce a natural tapered effect. These wire stems may be soldered together to form a twig, and this in turn soldered onto a larger wire on which the branch can be modeled. Sometimes a real branch is used.

Insect injury to trees costs Canada millions of dollars annually. In building groups of forest insects, Wood treats actual evergreen boughs to make them retain their needles. After soaking them in ethylene glycol, he dips them in liquefied gelatine. This process removes the color, so each needle must be painted individually. New growth is indicated by a lighter shade of green, and the "bloom" airbrushed on afterwards.

Insects naturally play an important role in this laboratory. The habits and appearance of wireworm, tobacco caterpillar and grasshopper are faithfully represented in Wood's models. Where needed, wings are cut from Celluloid and added to the wax model. In some cases, the insect is too small to show life size, so Wood departs from actuality. For instance, the wheat-stem sawfly was shaped after observation under a microscope, and set on a plastic tube carefully modeled to resemble a wheat stem—an enlarged version of the real thing.

(Continued to page 250)



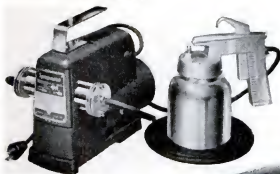
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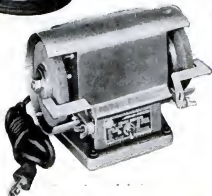


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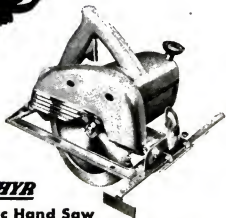
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Aluvac keeps dirt and sludge from clogging rings and valves, damaging bearings and moving parts—as never before. It gives Buick owners added engine dependability and even longer engine life.

You, too, can have AC Aluvac protection, for AC makes Aluvac Elements for most all filters. Have your service man install one in your car.

AC SPARK PLUG DIVISION



GENERAL MOTORS CORPORATION



IF YOUR CAR does not have an oil filter you can get a complete AC unit with Aluvac Element at moderate cost. Ask about it next time you change oil.

In addition to large and small displays of the past, Wood and his assistant, Robert Graves, are also working on full-size plants. A radish display—root, branch and maggot—is being made for several offices. A cabbage taken apart leaf by leaf to make molds will be assembled with cellulose leaves, cabbage butterfly, larva and egg. A cornstalk will stand four feet high when completed. Other life-size projects will include tobacco, potato and tomato plants.

A series of five fruits showing insect injury and disease is also planned. Another project is cases of a dozen perfect specimens of potato varieties for the Department of Agriculture in British Columbia. But that will be less exacting than the cases made six years ago, which showed mechanical injury to potatoes, sunburn, frostbite or bacterial ring-rot.

Three cases of forest-insect models went to the Festival of Britain. Another 23 cases will go to the new Forest Insect Laboratory at Sault Ste. Marie, Ont. Something Wood is really looking forward to is a large-scale diorama of the army worm, which he will create for a new entomological laboratory in Chatham soon.



Basswood sawdust, formed into a small "biscuit," is placed in a high-voltage X-ray unit for irradiation

Sawdust Chow for Cattle

Cattle may some day feed directly on sawdust or on small wood wafers if the material has been bombarded with high-voltage electrons. The bombardment makes the cellulose in wood digestible. When the sawdust is irradiated with electrons for about 12 minutes, its digestibility is about the same as for hay.

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HOW TO USE HAND TOOLS

WRENCHES and how to use them

A prime rule in using any adjustable wrench is to first adjust it to a snug fit on the nut to be turned. (Fig. 7.) A tightly adjusted wrench is safer since danger of slippage is minimized. A loosely fitted wrench will tend to "round" the corners of hexagonal objects, and may damage the wrench by exerting undue strains on the jaws. Greasy, oil-covered tools are dangerous. Keep handles clean and dry by occasional wiping. Oil should be applied sparingly to moving parts.



Fig. 7

Adjustable Wrenches develop their greatest strength when hand pressure is applied to the side of the wrench carrying the fixed jaw as in Fig. 8. They can, however, be pulled in either direction on moderate loads, and are frequently "flopped" between



Fig. 8

swings to gain an angular advantage and permit continuous rotation of nuts or bolts where cramped quarters limit the handle swing.

"Crestloy" Wrenches, being thinner (and stronger) than "Crescent" Wrenches, are the preferred tools for use in cramped quarters or when adjustable wrenches are used in pairs as in Fig. 9. For extremely heavy loads, Crestloys are likewise recommended. (See tools illustrated page 15.)



Fig. 9

PLIERS and how to use them

Slip Joint Pliers
Crescent Slip Joint Pliers are a general purpose tool having excellent gripping power over a wide capacity range because of their adjustable jaws. Ideal for holding or turning round pieces. Should not be used on nuts or bolt heads. (See tools illustrated page 15.)



Fig. 11

Now "rock" plier handles toward left wrist and the prying action will strip the insulation from the wire end.

"Cleaning" or brightening of the bare wire is shown in Fig. 12. Close jaws just enough to provide slight pressure and draw cutter blades along the bare wire a few times. Rotate wire with left hand so that the entire circumference is clean. (See tools illustrated page 17.)



Fig. 12



Fig. 20

Stripping Insulated Wire
Fig. 12 illustrates the proper way to grasp a light, diagonal plier. The third and little finger "inside" the handles provide pressure to hold the jaws apart. Pressure of the thumb stabilizes the tool and maintains desired jaw opening. To skin wire, grasp it as shown with the left hand, as in Fig. 11. Now with plier held, as shown, close the jaws sufficiently to cut through the insulation only. Don't cut through the conductor!

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The Owners Report on the '51 Oldsmobile

(Continued from page 108)



Called a "Stopometer," this compact device permits testing auto brakes at any speed by jamming them on without bringing the car to a complete stop on road

the Olds V-8 is the cheapest to run and maintain. While speaking of driving ease, I wish to state I have not used tire chains since driving a Hydra-Matic."

A St. Paul, Minn., orthodontist suggested: "As much as big cars are used for travel and vacationing, I feel they ought to at least make one side, next to the driver, convert into a bed. It certainly would help in the change-off of drivers for rest and convenience. I consider it an important feature in the Nash and I wish the Olds had it." There were a number of complaints on the carburetor and several reported they had changed to another make. (In my tests I found the carburetor could stand improvement, as through the entire range of acceleration up to about 70 miles per hour loading was noticeable at times under certain conditions, especially on long grades in the mountains. Generally speaking, however, the engine ran smoothly with a minimum amount of vibration.)

An interesting point revealed by the survey was that 76 percent of the owners prefer low-pressure tires but 58 percent carry 3.9 pounds more than the recommended pressure.

The observations of an East Cleveland, Ohio, mechanical engineer give a good slant on the general attitude of Olds owners. After listing a few minor objections, he said: "You may, however, put me down as an ardent booster for the Olds '51. I have never had more thrill and pleasure in driving. I only hope they keep up the good work and don't spoil a good car by future model changes except for appearance details and the like."

(Continued to page 254)

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3. HARD-GLASS LENS resists shock—is precision-built to throw maximum light on the road. Have lights checked next time your car is serviced—and insist on G-E lamps for replacement.

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How to sharpen AUGER BITS

GRIP the bit in a vise, or hold it firmly with one hand at a convenient angle against the edge of the workbench (as shown). In filing the bit cutters, follow the original bevel, removing just enough metal to take any nicks or bruises out of the edge. File only on the top surface of the bit's cutting edge. The lip is filed only on its inside edge.

The file to use. You'll get best results with Nicholson's K. & F. Auger Bit File. It has a double-ended tapered design which permits a narrow file section to be used on the edges of small-diameter bits, and wider sections on the larger bits. One end has its edges left "safe" or uncut; the other has its sides left safe. Thus one end of the file can be used on bit cutters, the other end on the lip, without damaging the threads of the feed point. Get it through your hardware dealer.

Auger Bit files are only one of hundreds of types of files in which Nicholson superior quality pays off in better results and value. Send for "File Philosophy" which tells about kinds, use and care—48 interesting illustrated pages. **FREE.**



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FOR EVERY PURPOSE

And now for my own test of the Olds 98:

Starting my test from mile-high Denver (exactly one mile above sea level at the Colorado Capitol steps), I drove the new Olds 98 four-door sedan about 800 miles in northern Colorado and southern Wyoming, across the plains and long level stretches, over the fine mountain highways and some tough back roads of the Colorado Rockies. Colorado is a great spot to test any car. Surprising to the first-time Colorado visitor is the apparent loss of power in any car due to mile-high or higher altitudes. The performance of any make of car falls off from

1951 OLDSMOBILE SPECIFICATIONS

ENGINE

Type.....	V-8-cyl., OHV
Bore and Stroke.....	3 1/2 in. x 3-7/16 in.
Piston Displacement.....	303.73 cu. in.
Horsepower.....	135
Compression Ratio.....	7.5 : 1
Transmission	3-speed conventional, or 4-speed Hydro-Matic (automatic trans.) available at extra cost.

GENERAL

	88	Super 88	98
Weight (4-door Sedan).....	3676 lbs.*	3773 lbs.*	3930 lbs.*
Wheelbase	119 1/2 in.	120 in.	122 in.
Tread, Front	57 in.	57 in.	59 in.
Tread, Rear.....	59 in.	59 in.	61 1/2 in.
Height	63.60 in.	63.60 in.	62.39 in.
Over-all Width	74.60 in.	75.66 in.	80.68 in.
Over-all Length	202 in.	204 in.	208 in.

Interior Dimensions (4-dr. Sedan)

Front Seat Width (Hip Room).....	59.92 in.	63.12 in.	64.10 in.
Rear Seat Width (Hip Room)	58.48 in.	63.40 in.	64.82 in.
Legroom, Front	42.68 in.	42.51 in.	43.52 in.
Legroom, Rear	41.60 in.	41.88 in.	42.26 in.
Headroom, Front	35.98 in.	35.53 in.	35.00 in.
Headroom, Rear	35.60 in.	35.02 in.	34.55 in.
Tire Size	7.60 x 15	7.60 x 15	7.60 x 15
Recommended Tire Pressure	24 lbs. front 22 lbs. rear	24 lbs. front 22 lbs. rear	24 lbs. front 22 lbs. rear
Road Clearance (Rear Axle).....	8.28 in.	8.16 in.	8.34 in.
Turning Radius	20 ft.	20 ft.	21 ft.
Circle Diameter	40 ft.	40 ft.	42 ft.
Steering Wheel, Lock to Lock.....	4 1/4 turns	4 1/4 turns	4 1/4 turns
Steering Ratio	19 : 1	19 : 1	21.3 : 1

CAPACITIES

Oil.....	5 qts.	Water.....	21 1/2 qts.	Gasoline.....	18 gal.
----------	--------	------------	-------------	---------------	---------

*Add 96 lbs. to weight shown for cars equipped with Hydro-Matic Drive

five to seven percent due to altitude. On the other hand, much higher compression can be used at high altitudes and the driver of a car with a bad ping at or near sea level usually finds that his knock disappears as he nears the Rocky Mountains.

The Olds 98 has the feel of a big car. It is sturdy, holds the road well and its big 135-horsepower (303.73 cubic-inch displacement) engine makes it a pleasure to drive. Olds pioneered the V-8 overhead high-compression engine they call the Rocket. The design is now gaining in favor with not only the car buyer but with other car makers as well. The engineering of the Rocket engine is outstanding, and there is no question about its leading the way for others. It is

(Continued to page 256)



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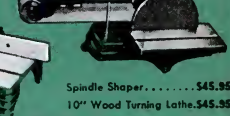
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When worn engine connecting rod bearings cause oil pumping, excess oil reaches combustion chambers, where it burns to performance-stealing carbon on pistons, rings, valves and spark plugs. Performance goes up in smoke!

Give new piston rings a chance to do their own job—on an oil pumper, always replace connecting rod and main bearings as well as the rings. Genuine Federal-Mogul Bearings are engineered for the job of oil control. Ask your mechanic!

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WHERE IT STARTS—REPLACE WITH

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really a flexible, power-packed and compact power plant.

Probably Hydra-Matic Drive (or any other automatic transmission) gets more use and abuse in mountain use than in ordinary driving. It changes now and then when least expected in mountain driving and sometimes not exactly at the right moment. Nevertheless, it is a satisfactory unit and even in the mountains I found no fault other than that it was a little rough in changing. There is no parking spot on the shift lever, but it can be locked if left in reverse. The ride is that of a large car, smooth and comfortable. Suspension, generally speaking, is good but, like most modern cars, it's a little too "soft" in the front end—there is some sway and body "roll" on sharp curves. Olds has discontinued coil springing in the rear for conventional leaf springs, which I like better, and so do 89 percent of those who replied to our question about leaf springs. I thought the steering a little too hard, a common fault when low-pressure tires are used, but the steering ratio is about right. It doesn't require too much steering-wheel movement to put the car where you want it. The wheel has a rigid and solid feel, and the car rights itself very quickly when coming out of a corner.

There is lots of trunk space and the lid is easy to open and close. The doors of the Fisher body operate easily. Driving position is satisfactory and comfortable. Brakes worked okay in the mountains and for decelerating from high speeds. Brake-pedal pressure could be a little easier and, now that the clutch pedal has been eliminated, a wider brake pedal would be desirable. The hand brake is good and is easily operated from the right side of the driver. The choke is automatic.

I drove in a bad rainstorm for two hours but no water leaks developed. Even over back roads that were rough and winding, I found the car to be free of squeaks and rattles. The body has a good solid "feel." The ventilating system is excellent. Two levers control the heat and the cool air. Starter operates by button and the instruments are grouped in a panel above the speedometer dial on the 98 and below on the 88, a very practical arrangement. The clock protrudes high on the cowl—both the clock and its location could be improved. Windshield is curved and one piece. Vision is average for a present-day car. The hood locks from the inside, which is good as it protects underhood units from possible loss by theft. Large wrap-around bumpers offer good protection in traffic or in case of accident.

For the weight and size of the 98, I found the gasoline mileage to be good (see my

(Continued to page 258)



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ARE SUCCESSFUL!

MAKE BIG MONEY BE YOUR OWN BOSS!

WANTED—men with ambition and desire to get ahead and *make money* in something for themselves. *Act now*—do as thousands of successful men have done—start on your own in floor surfacing with American Machines! Take advantage of this opportunity if you want steady year 'round work—earnings of \$25 and more a day—pleasant indoor working conditions—and a lifetime of comfortable living for yourself and your family. No schooling—no experience needed. Sanders are easy to operate. Hundreds of prospects—new and old homes. Send coupon for "money-making" booklet entitled "Opportunities in Floor Surfacing"—enclose 25c in coin or stamps to cover handling.

AMERICAN
FLOOR MACHINES



The American Floor Surfacing Machine Co.
535 So. St. Clair St., Toledo 3, Ohio

Enclosed find 25c in stamps or coin for booklet "Opportunities in Floor Surfacing", telling me how I can start my own floor sanding business.

Name _____
Street _____
City _____ State _____

It's Bright- It's Pocket Size!

It's palm-size—shaped to lie flat in small spaces. Brilliant light! Rust-proof. Dent-resistant. Luminous switch. Uses 2 standard 1½-inch flashlight batteries. Price, less batteries . . . **\$1.89**



DELTA ELECTRIC CO., MARION, IND.

Delta BUDDY LITTLE ELECTRIC LANTERN

Build your own SMITH Compressor

Operates spray guns, rock drills, tampers, paving breakers, sandblasting . . . Uses only 1 gallon of gas an hour!



Save Money—build your own Smith Air Compressor! Famous the world over! Capacity 60 cu. ft.; pressure up to 100 lbs. per sq. inch. Just order the Smith Compressor Head and Accessories with complete instructions for assembling. All you need is a Ford Motor and shop facilities. Head equipped with high speed compressor valves; automatic unloading and idling.

Write for complete information!
GORDON SMITH & COMPANY, Inc.
410 College Street • Bowling Green, Ky.

BETTER TOOL VALUES!

SEND FOR NEW FREE CATALOG



**INDESTRO
TOOLS**



Ready Soon—Brand New Mechanic's Catalog of Low-Cost, Long-Service Indestro Tools. Full of photographs and detailed descriptions of regular or special tools your dealer can supply for home workshop or professional use. Tells how to select good tools and why you get Better Value when you select Indestro Tools—for in-

stance, all sockets "Hot Broached" to make them wear longer.

Offers you big values in Tool Sets, from 5-pc Pouch and Chisel Sets to 114-pc DeLuxe Workshop Sets. Reserve your copy of this Dollar-Saving Pocket-Size Tool Catalog.



FILL OUT AND MAIL NOW FOR FREE COPY

Send to **INDESTRO MANUFACTURING CORP.**
2649 N. Kildare at Schubert, Chicago 39, Ill.

*Write your name and
address in margin space*



THE Original Fuel Pumps

*There Are
NONE
Better*

- ★ More than 40,000,000 in use.
- ★ More than 100,000,000 built.
- ★ Backed by 24 years of "know-how."

America's First and Finest
FUEL PUMPS

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

economy chart at different speeds and over different routes). The high-compression V-8 overhead-valve engine does offer better economy than other types of engines of comparable size and weight. Even though the powerful and snappy Rocket engine makes many a red-blooded driver who wants to "step on 'er" waste gasoline for his own thrill of a speedy take-off or a top-speed run, most owners were satisfied and reported good gas and oil economy.

I used premium gas and, with the high-compression (7.5 to 1) Olds engine, I think premium fuel is best to use. Ninety-five percent of Olds owners who answered our poll report the use of premium gas. Only one other survey (Cadillac with 98 percent premium-gas users) showed a higher percentage of owners using premium gas.

In performance I can see little difference between the 88 and 98 models. The larger and more luxurious 98 weighs over 200 pounds more than the 88 but, after getting under way, I found little difference between the two models. The 98 does not have quite the acceleration up to 70 miles per hour that the lighter 88 has, but above 70 the weight of the 98 seems to make little difference in top performance of the two cars on wide-open stretches. I drove the 98 from 98 to 100 miles per hour by speedometer. Like all speedometers, it was fast by about six percent, as compared to stop-watch timing. I prefer to use speedometer readings in my tests because, while a stop watch is more accurate, the average car owner just never uses a stop watch. Also, remember that my speed tests were made on long, level stretches (with no traffic) at altitudes well over a mile high, so top speedometer readings were from five to seven percent less than sea-level readings would show.

My tests show that Olds has a fast, powerful, dependable, well-built car with top performance in any kind of test. It's a really good car, with few defects. Through the years Oldsmobile has come far since the late Ransom E. Olds blazed the way for later Olds' success when he built his first experimental gas car in 1897. (In 1896 he had built a steamcar in his father's machine shop at Lansing, Mich.) Through the years most Olds models have been good. Owner surveys show it, and Olds' records on road and track prove it. Olds have won many stockcar races since the Rocket was introduced, including first place in the tortuous six-day road race (the Carrera Panamericana) across Mexico from Juarez on the Rio Grande to the Guatemalan border. Hershel McGriff, the winner in an Olds 88, averaged 87 miles per hour for 2178 miles over desert and mountains.



Off to a Good Start!

Headed for interesting jobs under the Airman Career Program are Private Karl O. Engstrom, pictured at left above, from Willmar, Minn., and Private First Class Bob Jones, right, from Yakima, Washington. Recently enlisted, both men's aptitudes and interests showed that they would make good weather observers. Now they are getting the chance.

Sergeant Henry B. Wuenbold, Jr. from Cincinnati, Ohio, is instructing Karl and Bob on use of the Theodolite in tracking hydrogen balloons to determine wind speed and direction at various altitudes.

When Karl and Bob finish training, under instructors like Sgt. Wuenbold, they'll be grounded in the basics of a vital, interesting job with the Air Force.

This same opportunity is waiting for you! The Air Force has technical schools in 44 career fields. You'll be taught an important job *and you'll be paid while you learn.* As you grow more expert you'll be advanced in rank and pay. Start now. Visit your nearest U. S. Army and U. S. Air Force Recruiting Station.



For SMOOTHER
MOTORING

INSIST ON
BOWES

**SEAL
FAST**

DEPENDABLE

**SPARK
PLUGS**

*Here's
Why -*



★ Every Bowes Plug is Individually Tested —tested at higher voltage than is ever encountered in your car.

★ Oversize Special Alloy Electrode . . . welded construction assures positive connection.

★ Extra Large Ground Electrode assures longer life for plug.

★ Husky Aluminum Oxide Type Insulator assures against porosity—sure proof against shorting.

★ One-Piece, Leak-Proof Construction.

★ Patented Engine Gasket Retainer Ring assures better contact and better heat transfer.

BOWES PLUGS

are tailored to YOUR car's motor

If your favorite SERVICE STATION does not handle Bowes Spark Plugs, write us direct for further information.

BOWES "SEAL FAST" CORPORATION
INDIANAPOLIS 7, INDIANA



Portable Copy Camera Gives Print-a-Minute

In one minute, a copy-camera kit, built around the well-known Polaroid Land camera, will produce a photographic copy of any printed material. No darkroom is required. The process chemicals are packed in pods in the roll of film as they are in all Land film. The copy unit has built-in illumination that eliminates reflections with polarized filters. Documents up to 11 by 14 inches can be copied. The case in which the camera is carried opens to form the stand, easel and camera support. You simply plug in the unit and it's ready to copy.

Bubbles Keep Sawmill Open

Bubbles of compressed air have come to the rescue of the sawmill operator. Most mills across the northern tier of states must close down in winter when ice forms across the ponds in which logs are floated to the saws. Warren Brown of McCall, Idaho, has kept his sawmill open throughout the winter simply by laying a perforated pipe along the bottom of the pond and forcing compressed air through it. As the bubbles rise to the surface they prevent the formation of ice. Even when the thermometer hovered around 26 degrees below zero for two weeks, an area 1200 feet long and 200 feet wide remained open. The air bubbles lighten the warmer water on the bottom and bring it to the surface. Thus the water does not reach the freezing point.

You'll find hundreds of time and money-saving uses for this

NEW 2 SPEED 100° ANGLE

**BUFFING AND SANDING
ATTACHMENT**

A complete kit with 2-speed,
100° angle drive unit, 5" rubber
pad, 2 5" sanding discs and
5" lamb's wool bonnet.

\$845*

*Price slightly higher in West and Canada

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TOOLS**

SINCE
1868

The Mark of Superiority



FITS ANY 1/4-INCH ELECTRIC DRILL and makes it an efficient rotary polisher and sander. Operates at 1/2 or twice drill speed. Exclusive 100° angle feature keeps drill and cord clear of work. A sturdy, smooth-running tool that makes countless jobs quick and easy. Grease sealed lubrication. Machine-cut steel gears. Ask for it at your hardware dealer's.

MILLERS FALLS COMPANY • GREENFIELD, MASSACHUSETTS



**EARN EXTRA
DOLLARS**

IDEAL LAWNMOWER SHARPENER

Saves work, saves time, helps you earn extra dollars! Sharpens hand, power mowers without disassembling. Complete shop in one machine — equipped with Bed Knife Grinder and "lapping-in" Reconditioner. Home owners, parks, clubs, cemeteries pay good money for efficient sharpening; get your share!

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Full line of top quality, fully guaranteed, chrome, factory-new mechanics hand tools. You save **HALF REGULAR PRICE** for tools of this quality. Our Permanent Price Protection Plan guarantees you wholesale prices.



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FREE NEW BIG RADIO CATALOG



Ready now! Complete with everything in radio, TV and electronics. Newest parts as well as old, standard lines. Paste coupon on penny postcard and mail today!

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NEW YORK 13.....100 Sixth Avenue
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**30 YEARS
OF
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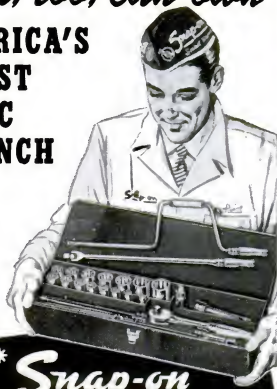
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PENNY
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Name.....

Address.....

City.....State.....

You, too, can own AMERICA'S FINEST BASIC WRENCH SET!



*** Snap-on
"MASTER SUPREME
SET"**

"THE CHOICE OF BETTER MECHANICS"—Everywhere!

Here is the wrench set for you who like fine tools... and *know the difference* they make in speed, workmanship, safety! Here, in a handsome steel case, is a full set of the *most needed* wrenches for general work, based on the repeated selections of experienced mechanics everywhere. Four handles, including a ratchet and speeder—3 extensions—a universal joint—and 15 most often-used sockets. All genuine *Snap-ons*... the *last word* in fine tool quality!

The Master Supreme set is the perfect foundation for any tool kit! Never sold in stores... you buy direct from factory (or from Snap-on factory branch in larger cities). Full information on this set, and thousands of other tools, in free Snap-on catalog. Write for it today!



SNAP-ON TOOLS CORPORATION
8062-J 28th Ave., Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.



Rubberized Paint

Combining the washability of an enamel with the appearance of a flat wall paint, a rubberized interior paint has a rubberlike film that prevents stains from penetrating the surface. Another advantage of the paint is that no special primer is needed on plaster. It dries in one hour and can be covered with a second coat in four hours. There is no unpleasant odor and brushes can be washed out in water after use.



Car-Window Plane

For air-minded youngsters there's a new toy plane that clips to a car window and can be made to climb, dive, spin or fly upside down in the car's airstream. The control rod fastens over the window glass with a rubber clamp. From safely within the car, the youngster can maneuver the plane by turning the control rod. Molded of Tenite plastic, the plane has a propeller that hums as the automobile moves along.

New! GRAVELY Portable Power-driven SAW

Clear land for crop or pasture! Saw for fells, trims trees. 19 other attachments for lawn, garden, field jobs. All gear drive; reverse. Write for catalog. "Power vs. Drudgery."

FREE

GRAVELY MOTOR PLOW & CULTIVATOR CO.
BOX 1063 DUNBAR, WEST VA.

ACE TOOLS



Be permanently
tooled-up for every operation
on your Metal Cutting Lathe.

No. 8-A Ace Tool Set
for 6" and 10" Swing
Lathes—fits shank size
3/4" x 3/4". Includes Turning,
Cutting-off, Boring,
Knurling and Threading
Tools with high speed cutters,
blades and wrenches. 8 complete tools
in fitted steel case—nothing else to buy
See your local dealer or order direct.

ARMSTRONG BROS. TOOL CO.
5268 W. Armstrong Ave., Chicago 30, Ill.

\$26⁹⁵

**NEW!
CHEAP!**

OIL BURNER SWEEPING THE COUNTRY!



\$14.75 for Stoves
\$29.50 for Furnaces

BIG CASH DISCOUNT FOR INTRODUCING. SLIPS INTO ANY COAL STOVE, RANGE OR FURNACE.

Amazing, quick intense heat — by finger-tip control.
No more shoveling coal or ashes. We'll let you try it in your own home for one month.
BIG BONUS FOR TESTING. Prove it pays for itself by what it saves. Write today for wholesale prices.
NORTHWEST MFG. CO., 360-M Main, Mitchell, S. Dak.



WOODWORKING VISE

for amateurs and professionals
USE UPRIGHT — FLAT — AT ANY ANGLE
MAIL CARD FOR FREE FOLDER TODAY
THE WILL-BURT CO., Dept. PM-9, Orrville, Ohio

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Greatest Bargain Book ever offered low, low prices, terrific savings on scarce war surplus.
Mail 10¢ TODAY — NOW — begin saving on hundreds of items for farm, home, shop, sports. Get your Bargain Book by return mail.

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MAIL
TODAY Only
10¢

POINTERS FOR HOME PAINTERS



**How to get better paint jobs
... make your brushes last longer**



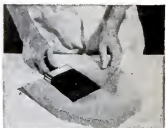
When you're painting overhead, dip brush to only one inch. Raise the brush quickly. Start in corners of ceilings. Use short, light strokes.



On rough surfaces, brush first coat in well to cover all cavities, prevent entrance of moisture. Brush second coat with smooth, even strokes.



For overnight cleaning, pour on a little thinner, work out paint on newspaper, using stick or paint scraper to squeeze out paint, suspend brush in thinner.



When you store brushes for longer periods, clean thoroughly and wrap securely in manner shown here. Brushes stay in better condition when they're kept in shape.

For best results use NYLON PAINT BRUSHES

Job after job, you'll get best results with a well-tipped nylon paint brush. Durable Du Pont nylon bristles don't break off, even on roughest surfaces. They last 3 to 5 times longer than ordinary bristles ... paint smoother ... are clean and sanitary. Nylon paint brushes are made by leading manufacturers in all types and sizes. Look for the word NYLON on the handle.



Better Things for Better Living
... through Chemistry

The best brushes have
**DU PONT NYLON
BRISTLES**

CEILINGS CRACKED? NEED MORE ROOM? WANT TO Modernize YOUR HOME?

Do the job easily,
quickly at low cost with

UPSON PANELS

FOR CRACKED CEILINGS:

No messy replastering! No ordeal of housecleaning! Apply Upson Kuver-Krak Panels on furring strips right over cracked plaster! Have a beautiful, crack-proof ceiling in a matter of hours! Unique Floating Fasteners eliminate visible face nailing! Panels are 5 plys thick, laminated for extra strength! Do not "drink" paint, one coat covers!

FOR MODERNIZATION:

Upson Panels saw like wood. Take screws, nails, fixtures, drilling! Pebbled, tile embossed or smooth surfaces! Hundreds of uses! Most lumber dealers carry Upson Panels in a variety of lengths, widths and thicknesses. All panel trademarks for specific uses. Heavy duty Strong-Bilt for new construction, Kuver-Krak for re-covering cracked ceilings. 1/4" Upson Panels for lighter uses. Use only as directed.

THE UPSON COMPANY

9810 Upson Point, Lockport, N. Y.

I enclose 10c for 32 page Idea Booklet. Include Instruction Sheet for applying Upson Ceilings and working drawings for Storage Wall FREE.

Name _____

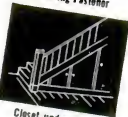
Street _____

City _____

State _____



Upson Floating Fastener



Closet under stairs



Beautifully your fireplace



Extra closet in bedroom



Your own bar



Magnifying "Flashlight"

Combining a seven-power magnifying glass with a flashlight, an inspection tool permits enlarged study of parts under any light conditions. The field of vision is clearly illuminated with no light rays being directed into the user's eyes. Other models are available with magnification up to 40 diameters, in which microscope-type barrels are attached to the eyepiece of the inspection device.

Dry Cleaner "Eats" Stains

Stains on fabrics are literally eaten and digested by a new type of "living" dry-cleaning powder. The dirt eater is an enzyme developed by Pabst Brewing Company of Milwaukee, Wis. It has a digestive action which "devours" stains caused by eggs, milk, ice cream, chocolate, coffee, blood, glue and other protein-base substances. Oddly, the enzyme has no effect on yarns with a natural-protein base such as wool. The powder, which is diluted with water, can be used to clean food spots from cotton, wool, nylon, rayon and some of the new acetate fabrics.

La Paz, Bolivia, is building a 16,000-foot concrete strip for the world's longest runway at the city airport, which is the world's highest.

DU PONT URGES TWO STEPS NOW

... BEFORE COLD WEATHER CAN CRIPPLE YOUR CAR

1st
*get your cooling system
checked and serviced*



When the cooling system quits, your car quits. If your cooling system is clogged with rust and scale, your engine will overheat. If your cooling system isn't tight, you'll lose anti-freeze mixture and risk a freeze-up. So before you put in any anti-freeze, no matter whose, have your cooling system thoroughly gone over. It is well worth the little it costs.

Go to an expert. The dealer who displays this emblem offers you a special winter service. Make a date with him early for anti-freeze and for a thorough cooling system check-up before the anti-freeze rush jams his driveway.

2nd
get a Du Pont Anti-freeze

"ZERONE" (TYPE S)

There's no evaporation problem with Du Pont "Zerone"—it's trouble-free, needs only an occasional check-up. Use it if you drive at normal altitudes, if your car has a standard thermostat (4 out of 5 cars do), and if you protect to temperatures no colder than thirty degrees below zero.

\$1.50 A GALLON

O. P. S. RETAIL CEILING PRICE



BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

"ZEREX" (TYPE P)

"Zerex" is made by Du Pont to meet these special driving conditions: High-opening thermostats—adjusted to run at 160 degrees F., or higher, high-altitude driving, and extreme low temperatures. If your driving requires a "permanent"-type anti-freeze, you can't do better than "Zerex."

\$3.75 A GALLON

O. P. S. RETAIL CEILING PRICE

*REG. U. S. PAT. OFF.



...it tells you your engine is heading for
PREMATURE OLD AGE

At the first sign of too much oil consumption, see your nearest garage displaying the Ramco RE-POWERING Sign. There your trouble will be expertly diagnosed. Then, if the rings are worn and in need of replacement, money-saving 10,000 mile (1 year) guaranteed Ramco 10-Up Rings will be installed. At the sign of RE-POWERING you are assured of competent engine repair of Compression, Carburetion, Ignition and Cooling; many stations offer a budget finance plan.

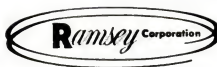
RAMCO 10-Up Piston Rings

Restore Power... Actually Curb Engine Wear!



Only Ramco 10-Up Rings have **Spiro-Seal**, the NO GAP continuous steel spiral that works like a spring to function perfectly in worn, tapered cylinders. **FREE BOOKLET:** "Inside Facts about Excessive Oil Consumption" gives the reasons why worn rings prematurely shorten engine life. Send postcard for your free copy.

5049



St. Louis, Missouri,
A subsidiary of
Thompson Products, Inc.

Around the Test Track in a Walker Bulldog

(Continued from page 131)

Another striking feature of the Walker Bulldog is its low silhouette, with angled surfaces that offer little opportunity for straight-on hits. This pushes ahead with a trend evidenced in the Patton, a nine-foot-high, 48-tonner that today ranks as perhaps the world's best medium tank. The World War II Shermans and Pershings were awkwardly high, according to the new standards, and made inviting targets.

The Bulldog will run on ordinary gasoline, but the Army isn't willing to say just yet what its range is without refueling. Extra fuel tins, obviously, can be carried outside and a limited supply might even be stored in the turret or its bustle.

No one knows how soon, or where, the Bulldog will romp with a purpose—but her builders promise she'll be a speedy and mean little customer if that occasion ever arises.



Uranium Test Kit

On-the-spot identification of uranium ore takes only five minutes with a pocket-size test kit. Because there are many materials which show up as radioactive on a Geiger counter, the prospector must test his findings to identify them as uranium. This kit, which contains test chemicals, a small blowtorch, wires and tongs, is used with any ultraviolet or black-light instrument. Uranium fluoresces a distinctive lemon-yellow color under ultraviolet light.

ALL BRAND NEW

FULLY GUARANTEED

**D. C. GENERATORS**

Fc. welders, plating, truck and marina use, D.C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty. Item #131—Brand new Electric Auto-Lite 12 volt Direct Current electric generators, rated 18 amps. Complete with battery, 12 ft. cables, fuses, bolts, battery chargers, etc. Part No. GEP-4805A. In original sealed U. S. Army cartons. \$40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only..... **15.00**

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Deico-Kemey and Westinghouse, Genvt. Acq. Cost \$300.00. Shpg. wt. 53 lbs. F.O.B. Chicago..... **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Leimer, Gov't. Acq. Cost \$380.00. Shpg. wt. 50 lbs. F.O.B. Chicago. Each individually packed in wooden box..... **35.00**

Vickers HYDRAULIC PUMP

PISTON TYPE—Ideal for use with hydraulic cylinders and valves described in this page ad. Vickers constant displacement piston type pump delivers .507 cubic inches per revolution, 8 gallons per minute at 3750 RPM, 1000 PSI. Has 1/2" diam. shaft, 3/4"-18 thread inlet and outlet ports. Rotations clockwise. Postpaid..... **19.90**



(Item #39)

**A. C. GENERATING PLANTS**

IMMEDIATE DELIVERY — LARGE STOCK — MANY SIZES
Item #133—3 KW—120 VOLTS—60 CYCLE A.C. SINGLE PHASE—HEAVY DUTY
DESIGNED FOR CONTINUOUS OR INTERMITTENT SERVICE

PLENTY OF CURRENT TO OPERATE YOUR— OIL BURNER • REFRIGERATOR • HOME FREEZER • SUMP PUMP • POWER SAW • BROODER • CREAM SEPARATOR • INCUBATOR • VENTILATING FANS • MILKING MACHINES • BLOWERS • YARD LIGHTING • OTHER APPLIANCES

Totally enclosed power unit with 2 cylinder water-cooled Hercules Model RXB engine direct coupled to generator. Magneto ignition, crank start, 4 gallon gas tank, 3 stage oil pump, 1500 RPM. Skid mounted with handrails for carrying. Instrument panel, killer button, oil pressure and water temp. gauges, voltmeter, ammeter. Shipping wt. 560 lbs. F.O.B. Chicago..... **395.00**



(Item #86)

Write for information on other sizes generating plants ranging from 350 watts to 25 KW. (Item #88)

BRAND NEW

CENTRIFUGAL PUMP**200 GALLONS PER MINUTE**

- For Draining Basements • Fire-Fighting • Irrigation • Fuel Transfer • Swimming Pools • Home Water Systems • Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2 1/4" standard pipe thread, twin outlets with 1 1/4" pipe thread, ball bearing supported 3/4" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't. acq. cost \$145.00. F.O.B. Chicago. Now Only..... **39.50**

(Item #130)

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	80'	240	6.2	3500
10'	85'	40	1.5	2500
10'	90'	100	3.0	2500

**HYDRAULIC SPEED REDUCER****WITH FINGERTIP CONTROL**

USE FOR: • Reamer Drives • Midget Motor • Feed Mill • Conveying Machines • Conveyors • Lathes • Milling Machines • Motor • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of 1/4 to 1 1/2 H.P. 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finish steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. 3/4" diam. include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 60 R.P.M. Gov't. acquisition cost \$425.00. Shipping weight 31 lbs. Complete with full instructions. F.O.B. Chicago..... **54.50**

(Item #115)

Both input and output shafts measure 3/4" diam. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 60 R.P.M. Gov't. acquisition cost \$425.00. Shipping weight 31 lbs. Complete with full instructions. F.O.B. Chicago..... **54.50**

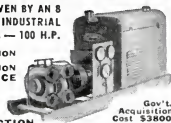
(Item #132) BYRON-JACKSON "PUP"

CENTRIFUGAL PUMP UNIT

2 STAGE MODEL "PUP" PUMP DRIVEN BY AN 8 CYLINDER MODEL C-36 CHRYSLER INDUSTRIAL ENGINE. ENGINE SPEED 2400 RPM — 100 H.P.

- 600 GPM AT 175 PSI
- PARALLEL CONNECTION
- 300 GPM AT 175 PSI
- SERIES CONNECTION
- IDEAL FOR: PIPE LINE SERVICE
- IRRIGATION • PICK-UP
- SALT WATER DISPOSAL
- GATHERING • FIRE FIGHTING • DEWATERING
- SPRINKLERS • CONSTRUCTION

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions, particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping can be changed for either parallel or series pumping applications. Overall dimensions, 114" L x 28" W x 62" H. Weight 2480 lbs. Now, complete with operating instructions, performance data. F.O.B. Chicago..... **1495.00**



Gov't. Acquisition Cost \$3800

Hydraulic Cylinders—Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient smooth pressure hydraulic cylinders on presses, lifters, loaders, power co. positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purulator hydraulic oil filter. Permanent element type 3/4" female pipe thread pump. Capacity 15 gals. per minute. A \$13.00 value. Now postpaid..... **4.95**

ITEM #24—All steel double action hydraulic cylinder. 1 1/2" bore, 2 1/4" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 PSI line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. Postpaid..... **4.95**

ITEM #27—Double acting hydraulic cylinder. 3" bore, 17" stroke, 1 1/2" diam. shaft, 1 1/4" tubing thread ports. Over-all length closed—6 1/2". Clevis mounting at both ends. Perfect for clamping and feeding. Postpaid..... **5.95**

ITEM #33C—Double action hydraulic cylinder, 1 1/2" bore, 4 1/2" stroke. Clevis mounting at both ends. Uses 1/2" pipe fittings..... **8.95**

ITEM #16C—Double acting hydraulic cylinder, 1 1/2" bore, 28" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$55.00 value..... **16.95**

ITEM #103—Double acting hydraulic cylinder, 2 1/2" bore, 17" stroke. Clevis mounting. Will lift 6000 lbs. with 1000 PSI line pressure. 1 1/4" diam. shaft, 3/4" tubing thread ports. Overall length closed 28". Shpg. wt. 11 lbs. F.O.B. Chicago..... **21.50**

ITEM #231C—Double action hydraulic cylinder, 3 1/2" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1 1/4" piston rod. Clevis mounting at base and shaft. 1 1/2" overall length closed. Will lift 9625 lbs. using 1000 PSI from Logan Heavy Duty Hydraulic Pump. Uses 3/4" tubing fittings. Value \$102.00. Shipping wt. 11 lbs. F.O.B. Chicago..... **22.50**

ITEM #26—Double action hydraulic cylinder, 3" bore, 24" stroke. Will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1 1/4" diam. shaft. 1 1/2" tubing thread ports. Clevis mounting at both ends. Shpg. wt. 26 lbs. F.O.B. Chicago..... **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated with 1000 PSI line pressure is 12,500 lbs. Shpg. wt. 30 lbs. F.O.B. Chicago..... **32.50**

HYDRAULIC CONTROL VALVE

Newly Manufactured to Our Specifications Four-way, open center control valve with built-in adjustable relief valve. Operates in either open, spring-loaded neutral position, for use with one double acting cylinder. Fully balanced plunger type, smooth, positive, easy operation, can be used as single unit or mounted in series of any combination. Has 3/4" pipe thread inlet and outlet, 1/2" pipe thread cylinder ports.

Rated with 1000 PSI line pressure is 12,500 lbs. Shpg. wt. 30 lbs. F.O.B. Chicago..... **21.50**

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(Item #126) standing Buy! F.O.B. Chicago.....

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GROBAN SUPPLY CO. 1139 SO. WABASH AVE. CHICAGO 5 ILL. DEPT. PM10

Instant Flame with a *Twist of Your Fingers!*

PREPO

The new principle **TORCH** *with the*

THROW AWAY FUEL TANK



**IT'S SAFE!
ECONOMICAL!
CONVENIENT!**

**THE
IDEAL
XMAS
GIFT
FOR
MEN**

Open the valve—apply a match—and presto! There's a hot (2200°F.) flame at your finger tips, ready for soldering, removing paint or putty or any of the 101 uses you expect from a torch. No pouring, no priming, no pumping, no messing around with dangerous bulk fuel. The amazing new Prepo Fuel comes in replaceable fuel tanks. When one is empty after hours of steady use, merely throw it away and insert a new Prepo Fuel tank. Get your Prepo Torch at your favorite store—and buy Prepo Torches for your friends. It's the new kind of Christmas gift men appreciate.

Four Models — All Using Same Tank of Fuel

Prepo Master Torch has two interchangeable burners, a pin-point burner for precision work, and a heavy-duty burner for larger work requiring a volume of heat. Designed to fill the needs of the demanding industrial user.

Utility Torch with fixed burner produces medium sized flame for average job around shop or home. Two other models feature fixed, non-interchangeable burners, either pin-point or heavy duty.



PRESSURE PRODUCTS CORPORATION

140 N. Dearborn Street Chicago 2, Illinois

Jet-Propelled Flying Boat

(Continued from page 125)

many of the models resemble the skate member of the marine ray family, has advanced through nine models and is continuing. Skate 7 is the scale model of what would be a 20-ton, blended-hull, twin-jet fighter-bomber, with a 40-degree swept-back wing and leading-edge slots.

Flights with the Skate 7 model show that the aircraft would take off from the water in a shorter distance than a comparable wheeled aircraft requires on concrete, would have no tendency to porpoise or water loop, and would have a top speed in the order of Mach 0.95, just under the speed of sound. The model has been tested in scaled waves equal to actual waves 11 feet high, and is far more seaworthy than conventional flying boats. The retractable spray dams, comparable to the bilge keels of a ship, keep water turbulence at a minimum and prevent spray from flying up and disturbing the flow of air over the wing and tail group. Alternate air-intake doors are provided for furnishing air to the turbojet engines when operating in heavy seas that might swamp the ram air ducts in the nose.

One of the objections to water-based aircraft has been the difficulty of handling them in rough water for such purposes as fueling, arming and placing crews on board. Part of the Skate research program has been to develop better, faster handling methods, the details of which have not been released.

"But it's safe to say that the pilot of a water-based interceptor won't be using a rowboat to get out to his craft when an alert sounds," Stout remarks. "The elapsed time from Ready Room to 50,000 feet will be as short or even shorter than with conventional wheeled aircraft."

Lubricant Made of Metal

"Metallic oil," a lubricant made from molybdenum, is available for use in automobiles. The lubricant has been used for some time in big hydraulic presses and other heavy equipment because it withstands higher pressures and temperatures than conventional oils. The lubricant consists of tiny particles of metal suspended in a liquid. It is used with the regular oil in the automobile. The metal particles are carried to the bearing surfaces, which they "plate out" by molecular attraction.

(Screwed on the valve stem like a valve cap, a safety device whistles loudly when tire pressure drops dangerously low, providing advance warning of a flat tire.

POPULAR MECHANICS
Louell Products Co.
423 Fulton St.
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Proudest man in motorcycling!

He owns the world's greatest motorcycle

1952 HARLEY-DAVIDSON *HYDRA-GLIDE*®

Star-studded with newest engineering advancements, and built like the costliest car, this greatest of motorcycles will thrill you, too! It whisks over straightaways like the wind, wings over hills like a bird, floats you cloud-like over roughest roads, steers so easily, rides so comfortably even longest trips are a never-ending delight! And this year, it's better than ever . . . with four-speed foot shift-hand clutch, Parco-Lubrized valves, more power than ever from "motorcycling's mightiest motor," luxurious new color-styling and other features. Truer than ever is the old saying, "There's no sport like motorcycling, no satisfaction like owning a Harley-Davidson!" See your dealer today. Mail the coupon now.



featuring...

- New 4-speed foot shift-hand clutch
- New low-toned, power-boasting muffler
- New Parco-Lubrized exhaust valves
- New longer-life tire tread
- New colorful styling



HARLEY-DAVIDSON MOTOR CO., Dept. P, Milwaukee 1, Wisconsin

Send me free copy of ENTHUSIAST Magazine filled with motorcycle action pictures and stories; also literature on new models.

Name.....

Address.....

City.....State.....

DEALERS WANTED: A few franchises available for the full line of famous Big Twins and the 125 Model. Write today.

Big, Money-Saving Offer Repeated by Popular Demand

MEYERCORD'S AMAZING, LIFELIKE
PLASTIC VENEER

it's easy to
DECORATE

- furniture
- cabinets
- lamp bases
- book ends
- walls, doors
- table tops
- re-finish old pieces

Re-creations of
rare wood grains
and fine marble

SAVE NOW! SEND FOR INTRODUCTORY PACKAGE!

Now—Meyercord, originators of Plastic Veneer, again offers you re-creations of rare wood grains and fine marbles at a *big saving!* Used on furniture and TV cabinets for years, yet easy to apply at home—on wood, metal, glass or composition. Praised by thousands of home craftsmen for a m a z i n g l y beautiful results! Plastic Veneer can be used on any flat or simple curved surface—can be top-coated, rubbed or waxed. Start your first project today! Order a supply now!

INTRODUCTORY OFFER!

3 sheets of plastic veneer
1 can of cement **\$5.00**
1 squeegee
ALL FOR ONE PRICE **POST PAID**

CHECK COUPON — MAIL TODAY!

THE MEYERCORD CO., Dept. 67-10, 5323 W. Lake St., Chicago 44, Ill.

Please send me your \$5.00 introductory offer of 3 sheets of Meyercord Plastic Veneer, squeegee, cement and complete instructions. Patterns are checked below.

Enclosed find ☐ check, ☐ M.O. for \$5.00. Plus \$ for additional sheets, @ \$1.50 for wood grains, \$1.60 for marble, pearl and gingham. Each sheet contains 6 sq. ft.

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| <input type="checkbox"/> Prima Vera | <input type="checkbox"/> Carpathian Burl |
| <input type="checkbox"/> Aspen Crotch | <input type="checkbox"/> French Rosewood |
| <input type="checkbox"/> Straw Carpathian | <input type="checkbox"/> Butte Walnut |
| <input type="checkbox"/> Satinwood | <input type="checkbox"/> Walnut Stump |
| <input type="checkbox"/> Straw Zebra wood | <input type="checkbox"/> Italian Walnut |
| <input type="checkbox"/> Limed Oak Tan | <input type="checkbox"/> Rhododendron Burl |
| <input type="checkbox"/> Straw Stump | <input type="checkbox"/> Massassur Ebony |
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| <input type="checkbox"/> Walnut Crotch | <input type="checkbox"/> Jaune Benou Marble |
| <input type="checkbox"/> French Walnut | <input type="checkbox"/> Mexican Onyx |
| <input type="checkbox"/> Quartered Walnut | <input type="checkbox"/> Rose de Brignole Marble |
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(Offer good in continental U.S.A. only)



Department of Defense photo

White Tires Increase Safety Of Military Transport Planes

Pretty as well as practical, white sidewall tires are being tried on some Douglas Skymasters of the Military Air Transport Service. During night landings they are more readily seen against the dark sky than black ones when pilots ask the control tower for visual confirmation on whether their wheels are safely down. Lt. Comdr. John C. Lafferty of Naval Air Transport Squadron Eight, Pacific Division, originated the idea. Ordinary white sidewall paint is put on the outsides of the four main tires and both sides of the nose wheel tire.

Employees Tested

Brain-wave recordings to test employees may greatly reduce accidents among critical industrial personnel who hold positions that might endanger the lives and property of others. According to Drs. Joseph L. Fetterman and Victor M. Victoroff of the Fetterman Clinic in Cleveland, Ohio, brain-wave records give a more useful test than electrocardiograms or heart-wave records. This is because they might pick up signs of unnoticed damage to the brain, which might not otherwise be recognized. Whether lack of sleep will so seriously harm brain functioning in valued personnel as to risk accident may also be determined with the records.

(More than two million natural and synthetic sapphires are used each year by Westinghouse Electric Corporation in the manufacture of watt-hour meters, electrical instruments and protective relays.

Why Permaglas

AUTOMATIC WATER HEATERS

outlast all others



Cutaway view shows Permaglas gas water heater construction detail. Permaglas Automatic Water Heaters are available in sizes from 20 to 80 gallons in Electric, Gas and LP-Gas models.

Contact your Registered A. O. Smith water heater dealer listed in your classified telephone directory, or use the handy coupon now for additional information about Permaglas, the automatic water heater with glass-surfaced steel tank that can't rust because GLASS CAN'T RUST.

A.O. Smith

AUTOMATIC WATER HEATERS

Permaglas water heaters are the *only* water heaters built with *Ceramitron construction* to provide complete protection against corrosion in four ways:

1. Glass-surfaced steel tank is completely protected by special A. O. Smith glass, permanently bonded to the entire inner surface under 1700°F. temperature. Glass can't rust!
2. Elimination of dissimilar metals prevents electrolysis, the cause of corrosion.
3. Dielectric protection of tank metals by shielding.
4. Neutrolizer within tank affords stand-by protection.

NO OTHER WATER HEATER PROVIDES SUCH THOROUGH PROTECTION AGAINST ATTACK BY CORROSIVE WATERS

Then consider the modern styling, baked-on Neotone enamel finish, superior temperature controls, extra thick fibrous glass insulation, and the high recovery rate with the HEETWALL... and you'll conclude that Permaglas is the automatic water heater for your home!

COST NO MORE

THAN ORDINARY WATER HEATERS!

A. O. Smith Corporation
Water Heater Division, Dept. PM-1051
Kankakee, Illinois

Send me complete information on your Permaglas Gas ☐ Electric ☐ Automatic Water Heaters, including your illustrated booklet on "Ceramitron" Construction.

NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

WHAT...
that muck
in my car?



A mucked-up
oil filter can cost you
plenty in engine repairs.
Get in a new **Purolator*** Refill—quick!

Hard to believe—but true! A filter may collect over 2 pounds of engine-wrecking muck out of your motor's oil stream. It gets clogged in time—can't keep up its motor-saving . . . dollar-saving work.

What to do? Don't delay—get in a clean filter refill—fast. **Which make?** Pays to buy the best—a Purolator Micronic*. New accordion-type design gives up to 10 times the filtering area—with pores so tiny they trap particles you can't even see. **Cost much?** Strictly small change—\$1.38 to \$3.00 depending on car make. Purolator Products, Inc., Rahway, N. J.; Toronto, Ontario, Canada.

*Reg. U. S. Pat. Off.

PurOlator
MICRONIC
OIL FILTER

Right you are—it's **JOE E. BROWN**
co-starred in "SHOW BOAT,"
an M-G-M Picture. Color by Technicolor.



Seed-Potato Cutter

Seed potatoes are cut into four sections automatically by a cutting machine that does the work of 10 laborers. The tubers are loaded in five cups attached to an endless chain which pulls the cups up and past a series of knife blades.



Composes Headlines

Smudgeless proofs of headlines for offset reproduction can be quickly and inexpensively prepared by a small composing machine that measures only 18x18x8 inches. Producing the proofs photographically, it uses type fonts printed on film negative and positioned by turning a knob.

LOOK!

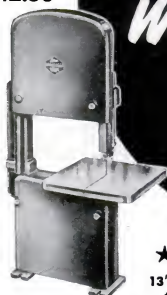
★ **NEW** 8" BENCH SAW
\$33.95



★ **NEW** 4" JOINTER
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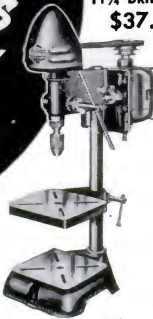


★ **NEW** 10"
BAND SAW
\$42.50



*These 5 Atlas
Workshop Tools
FOR ONLY
\$161.20*

★ **NEW**
11 3/4" DRILL PRESS
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13" JIG SAW
\$18.50



ALL PRICES LESS MOTOR
F.O.B. KALAMAZOO, MICH.



- AND ALL CAN BE OPERATED FROM 1 MOTOR

★ Look at the tools . . . *look at the prices!* If you're one of those men who have long wanted a home shop equipped with fine precision tools, but haven't wanted to spend the money for large, expensive machines — these Atlas Workshop Tools will suit you to perfection. Each one is backed by 40 years of Atlas precision-engineering. They give your shop *greater versatility at less cost* than any tools or combination tool you can buy! — *and all 5 can be powered with 1 motor!* You'll want to see them at your first opportunity. Ask any Atlas or Atlas-Power King dealer for full details. Send the coupon for complete catalog.

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The book that's
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1660 pictures that
really show how
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Why pay out your good money on sky-high repair bills? You can handle those jobs as well or better yourself, with the expert know-how in this big new Handyman's Book. 14 full sections show how to:

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The A to Z of repairing and improving your home:

HEATING. How to
Reduce fuel costs
Service oil or gas
Clean chimneys, etc.

PLUMBING. How to
Open clogged drains
Thaw frozen pipes
Fix leaky faucets, etc.

ELECTRICAL. How to
Replace fuses safely
Care for appliances
Prevent "shorts," etc.

WALLS. How to
Waterproof basements
Install wall-panels
Hang wall paper, etc.

STORAGE. How to
Install kitchen cabinets
Build storage walls
Remodel closets, etc.

WINDOWS. How to
Fix broken sash-cord
Replace broken panes
Cure "sticking," etc.

FLOORS. How to
Refinish floors
Repair wood or tile
Lay linoleum, etc.

EXTERIOR. How to
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Repair foundation
Fix leaky roofs, etc.

FURNITURE. How to
Repair upholstery
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Use foam rubber, etc.

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Use saws and drills
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Use for best results
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and hundreds more, completely indexed

FASTENING. How to
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Use solder and tape
Glue for keeps, etc.

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Paint walls and trim
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LUMBER. How to
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Better Homes & Gardens,
1210 Meredith Bldg.,
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Please send at once my copy of your
big new Handyman's Book, on 10-day
trial. I enclose \$3.95 — which you
will refund in full if I decide to return
book in 10 days, after receiving it.

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Address.....

SCHICK INJECTOR WINS 5 TO 1 IN U.S. SHAVING TESTS*

USES FAMOUS "GOLD PACK" BLADES THAT
GIVE FINER SHAVES THAN ALL OTHERS
—INCLUDING OUR OWN OLD BLADES!



WORLD'S ONLY RAZOR with all these big advantages:

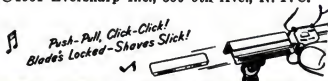
Blades change *automatically*—"lock" at same, precise angle—no adjusting...

Light weight makes shaving easier! Safety-Bar smooths down skin... "Fits" face—around nose, lips... Uses new "Gold Pack" Blades!

*HERE'S FULL SCORE FROM SHAVING TESTS

Smoother Shaves 5½ to 1 Safer Shaves 7 to 1
Cleaner Shaves 5 to 1 Faster Shaves 5 to 1
More Shaves per blade, nearly 2 to 1

*Men in 10 cities—nationwide—compared New Schick Injector Razor and "Gold Pack" Blades with whatever they had been using. About 80% of the men had a preference. Of these, the votes were in the ratios shown above.
©1951 Eversharp Inc., 350 5th Ave., N. Y. C.



SCHICK INJECTOR

RAZOR and BLADES



Electric Runabout

Two hand levers operate an all-electric automobile being made in California. The two-seater is powered by a 24-volt d.c. motor, and its battery is recharged by plugging it into any household electrical outlet. The maker claims the "Autoette," which normally travels about 15 miles an hour, can be run 750 miles for one dollar.

Plants Get Superphosphate Quickly

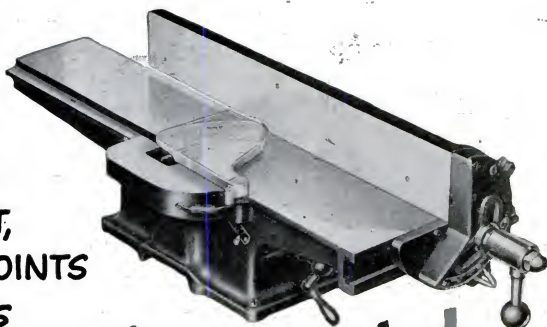
Atomic science has proved that when farmers add superphosphate fertilizer to the soil it soon reaches the plants. Two Swedish scientists added radioactive-phosphate fertilizer to the soil and then dissolved out the water-soluble phosphorus. By measuring the proportion of radiophosphorus, they discovered how quickly the plants received fertilizer. They found also that fertilizer added to the soil soon mixed thoroughly with the water-soluble phosphorus of the soil.

□According to the National Geographic Society, over 400,000 miles of underwater cable are in service to carry communications between all parts of the world.

**PLANE
TRUE,
STRAIGHT,
SQUARE JOINTS**

WITH THIS

DELTA 4-inch Jointer



- ★ *Adjustable front and rear tables*
- ★ *ONE control to slide and tilt fence*

You can do real quality joining speedily, easily and safely with this remarkable tool—the finest ever offered for home workshops.

Check over these excellent practical features that mean more accuracy and greater satisfaction with the Delta 4-inch Jointer.

- It's a big, husky machine
- three knives are held in a specially balanced revolving head which runs on lubricated-for-life ball bearings
- knives are precision-ground to match and balance
- fence is rigid and heavy—no deflection; can be moved entire width of table
- fence tilts 45° in either direction—automatic, stops at 45°, 90° and 135° from table
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- super-safe guard covers knives
- tables raise and lower on V-ways, with adjustable gibs to take up for wear.

See this fine Delta Tool at your nearest Delta dealer; and send for the valuable free book "How to Start Your Homeworkshop"—scores of pictures, ideas, helpful suggestions. Use the coupon.

There's a Delta Tool for Your Job—

WOOD OR METAL WORKING

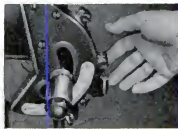
**53 MACHINES 246 MODELS
MORE THAN 1300 ACCESSORIES**



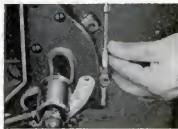
★ Dual control handle sets and securely locks fence in any position across table



★ Dual control handle tilts fence and securely locks it to any angle desired



★ Automatic stops set at 45°, 90° and 135°; large scale for accurate settings



★ Stop screws individually adjustable for absolute accuracy; fence will always automatically stop at setting.

**DELTA
MILWAUKEE**



DELTA POWER TOOL DIVISION

Rockwell

MANUFACTURING COMPANY

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- ☐ Please send me the "How to Start Your Homeworkshop" book.
- ☐ Please send me the name and address of the nearest Delta dealer.

Name

Address

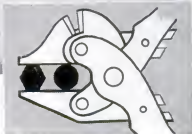
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The plier that grips like a vise...



a tight grip on anything



...the handiest tool in any kit

It's a plier, a cutter and a wrench. Sargent Bernard Parallel-Action Plier.

Grips like a vise. Cutters on outside where they are easier to use. Non-slip parallel jaws won't chew up nuts.

Compound leverage greatly increases the cutting power of these pliers. Finest tool steel, sizes $4\frac{1}{2}"$, $5\frac{1}{2}"$, $6\frac{1}{2}"$, $8"$.

Ask to see them at your hardware store or write us for full information. Dept. 20K

A better tool by —



Sargent and Company

New York New Haven, Conn. Chicago

Builders Hardware and Fine Tools since 1864



C1

COLORCRETE

Drab or dirty masonry—concrete, stucco, etc., becomes gleaming white. Or there's a range of sparkling colors—ivory, cream, pink, blue, green, and 25 more. Colorcrete is fused to masonry surfaces under pneumatic pressure. Stays put and stays beautiful. Highly water resistant. Used for more than a quarter century.

There's Profit-Appeal in Stucco Spraying

The business of applying Colorcrete is a community enterprise, with special appeal to men of limited capital. Equipment is compact, simple to operate, practically wear-proof. Work is easy, interesting and rich in profit potentials. Broad opportunities for development. We supply all equipment and full instructions.

No experience or special ability needed. Write or wire today for the Opportunity Book.

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CARBURETOR TOO RICH MAKES MOTORIST TOO POOR



Car owners who are wasting money and not getting proper gas mileage due to over-rich mixtures will be pleased to learn how to save gasoline by VACU-MATING over-rich mixtures. VACU-MATIC fits all cars, trucks and tractors. It is automatic and operates on the supercharge principle. Easily installed in a few minutes.

SALESMEN WANTED! Big Profit!

Send name, address on penny postcard for free particulars and how to get yours for introduction.

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ONE-MAN SAWMILL LOW \$500 DOWN AS... \$500 DOWN



Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for local yards do "custom sawing" for neighbors. BELSAW lasts a lifetime. No crew needed. Power with old auto engine. Beginners get excellent results. Send postcard for FREE BOOK, "How To Make Lumber."

BELSAW MACHINERY CO.
8116 Field Bldg. 315 Westport Rd., Kansas City 2, Mo.



ELECTRIC WELDER AC or DC 110 Volts

"The Little Marvel" All-Metal welder. 5-year written guarantee. Welds $\frac{1}{8}"$ thick metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Comes complete with everything—rods, unit, eye shield, and directions. We also make a welder for 16 to 22 gauge metal... \$3.95 complete. On C.O.D., postage extra.

ESSAY MFG. CO., Inc., Dept. 51, Quincy 69, Mass.

\$6.45 Complete

BUILDING YOUR OWN

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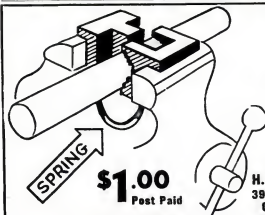
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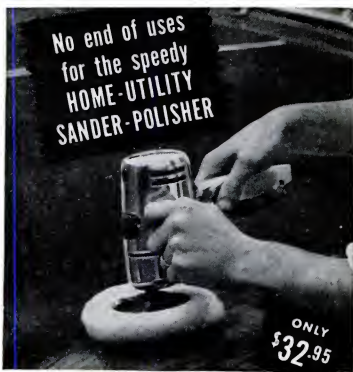
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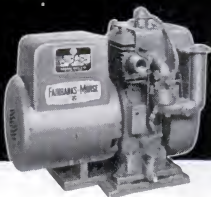
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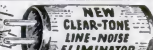
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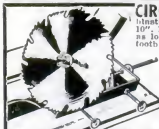
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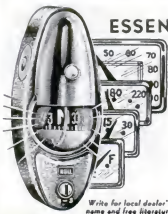
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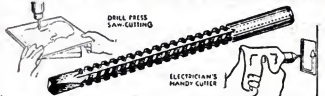
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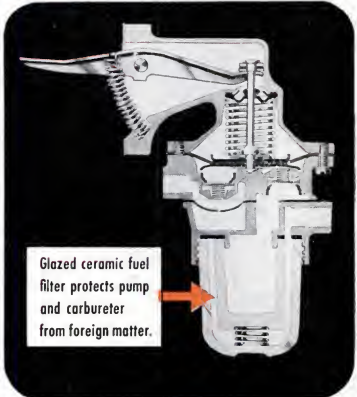
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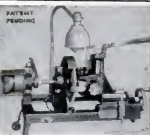
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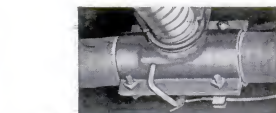
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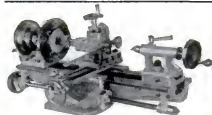
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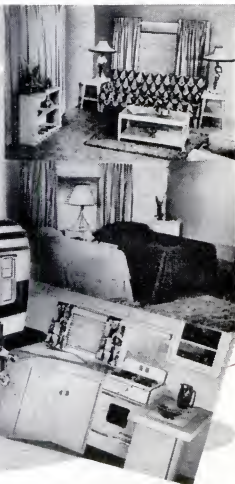
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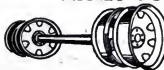
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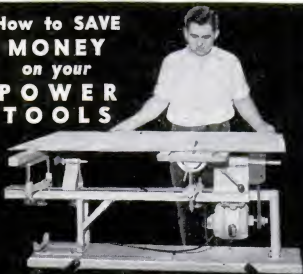
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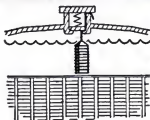
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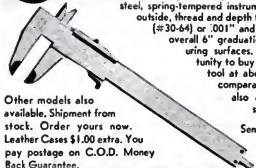
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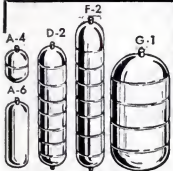


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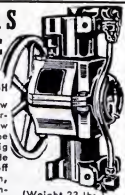
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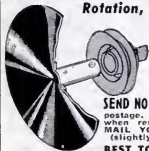
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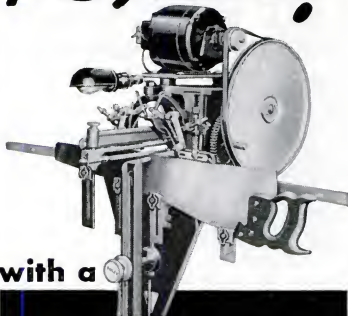


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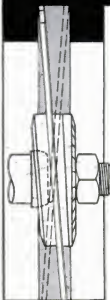
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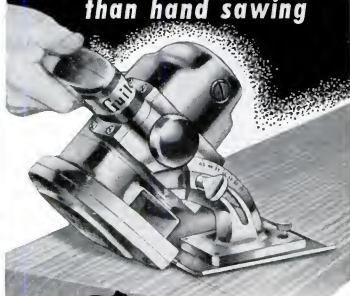
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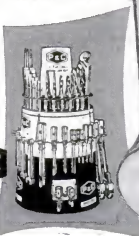
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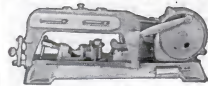


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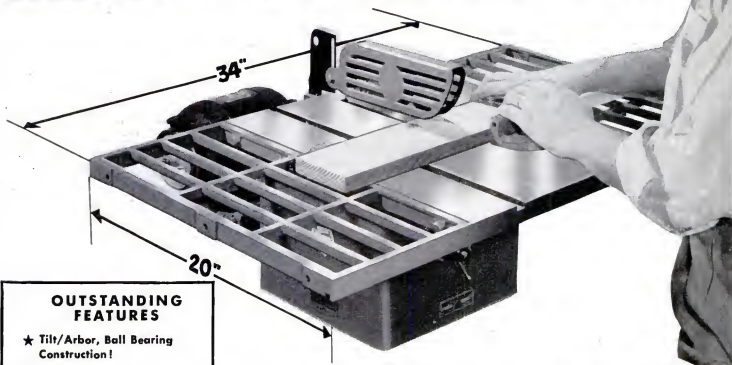
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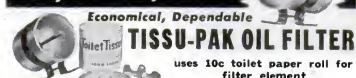


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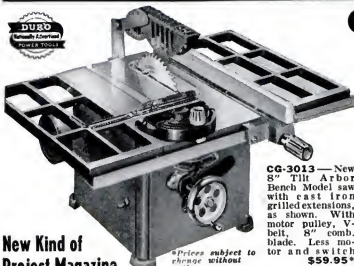
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Make complete workshop outfit of your 1/4" drill, using these practical accessories. Quick change—merely insert shaft in drill chuck. Carry heavy duty tools for steel and iron. Built-in bit of hardened tool steel. Factory guarantee and instructions.
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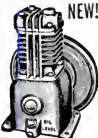


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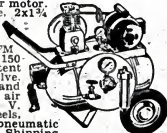
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Pollers will cut the Slab or Cored Stock stock to your needs. However all pieces must be rectangular or square in shape at least 1 square foot or larger.

TOPPER PADS	per sq. ft.
12" x 24" x 1/2"	\$7.95
12" x 24" x 1"	\$8.95
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22" x 18" x 3/4"	\$5.00
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22" x 18" x 1"	\$10.75
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Soft, luxurious and restful. From a FULL DOUBLE BED SIZE to a baby cradle. Nothing healthier to sleep on.

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76" x 27 1/2" x 4" (baby bed size)	41.95
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Some as above but with durable pattern cover - \$92.95
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Consists of two units. Designed to operate controls on boats, machinery, engines, motors, etc.

Without need for rods, cables, pulleys, etc. When connected with 1/2" rubins & filled with oil they act as a precision, remote controller. When Master handle is moved, Slave arm responds in exact motion. Range is 0 to 90 degrees.

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Telephone type, highly sensitive with excellent clear tones. This was the Signal Corps favorite. An ideal instrument for the radio "ham" and professional recording studio, broadcast, home recording, public address, etc. A sensational buy! Complete with cord and plug - \$269

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NEW ILLUSTRATED 200 PAGE CATALOG 1000's of money saving bargains for the mechanic, housewife, Manufacturer, Hobbyist, etc. Clothing, Tools, Machinery, Metals, Electrical Supplies, Motors, Rubber, Plastics, Hydraulic supplies (cylinders, pumps, motors, valves, fittings, hose, etc.). SEND ONLY 25c to cover mailing & handling.

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300 AMPS CONTINUOUS
350 - 400 AMPS INTERMITTENT.

For light or heavy duty work. Will easily handle welding up to 1/2" plate. Made to operate continuously, giving years of trouble-free service. Built around that famous 8-29 (A-1) generator incorporating many features no other generator has. Unit includes pulley retractor control, Hi-Lo switches & rheostat. All assembled in heavy steel frame and easily adapted to mounting on Jeep or tractor for portability & power supply. Can be run on 7 1/2 HP electric or 10 HP gas motor. Generator alone cost Gov't \$500! NOW ONLY \$9750



Navy Sealed Beam Lamp
U.S. Navy Portable searchlight. Has pistol grip and aiming sight. Makes an ideal Search, Spot or Emergency light for Auto, Boat, etc.

12V. light - 4" lens \$329
24V. light - 5" lens \$379
Set of 3 filters - red, green, amber. (specialty type lamp) \$99

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A handy light for desk, work bench, chart table, engine room, etc. Can be changed to 6-12-24-110 Volt by using double bulb. 1 ft. shaft has 4 points to adjust position - \$329

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Operates on direct drive with a flex shaft from camshaft or at 2 to 1 reduction from crankshaft. Range is 0 to 4500 rpm. Ideal for planes, boats, autos, etc. \$475

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Keeps Food Hot or Cold
Take your HOT or COLD food wherever you go. This handy, compact, insulated food container holds enough food for 8 people. It consists of a sturdy bakelite case containing 2 separate, 5 qt. Pyrex baking dishes with lids and 1-9 qt. plastic container for carrying ice water, additional food, paper plates, cups, utensils, etc. A real time and money saver on all trips, picnics, parties, etc. Enjoy real home cooking wherever you go. Overall height 16". \$1095

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Rain-proof, weather resistant, hand line in fishing for tuna, marlin, etc. Also has many uses around farm, factory and outdoors. NEW in 300 ft length. \$169

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For hunting, winter sports, skiing or "bundling". Covers for cold outdoor, or farm work, 100% woven wool with extra flannel inner lining for double warmth & utility. Wearing so fine, flexible it does not interfere with movement. Can be used with or without heating or can be plugged into car, tractor, or truck battery. Sizes 36 thru 44. \$795

17 Power Telescope
A fine quality, IMPROVED instrument. Gives a bright, clear image with a wide field of view. An ideal telescope for all-around use. ONLY \$795

20 inch TANK TELESCOPES
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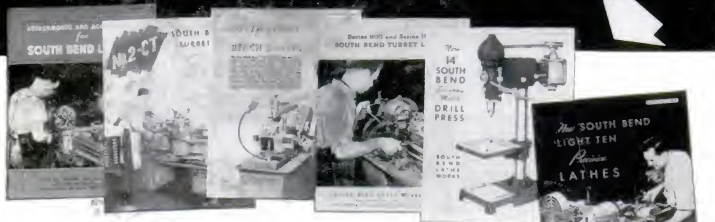
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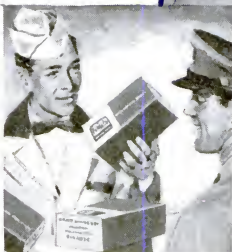
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